ICMR-NICED

ACHIEVEMENT & ACTIVITY REPORT

2021-22

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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NATIONAL INSTITUTE PF CHOLERA AND ENTERIC DISEASES

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

In the spring of 2021, we were slowly recovering from the COVID 19 pandemic and trying to embrace the new way of life. The health workers were given COVID 19 vaccines and clinical trials were underway to introduce the indigenous vaccine Covaxin. The SARS CoV2 virus struck again in April 2021 with the devastating second wave of highly pathogenic Delta variant. The mortality rate and morbidity of the new variant was very high, crippling the health care system of India. The ICMR-NICED scientists and staff continued relentless service to the eastern zone through timely validation of diagnostics, molecular kits, supplying diagnostic kits to the testing labs, ILQC of testing labs and participating in ICMR sero surveillance.

In addition to the services, NICED also completed the rBCG, COVAXIN (BBV152) Phase III and mRNA based vaccine trials against COVID 19. BBV152 was found to be highly efficacious against laboratory confirmed symptomatic COVID19 disease. **The trial results led to successful approval and launch of COVAXIN by the Honourable PM Narendra Modi on 16th January, 2021.** Research on SARS CoV2 was done in parallel through whole genome sequencing and mutational analysis. The study revealed several important signature constellations of the non-spike protein mutations in Delta variants. Based on the analysis, a novel lineage was identified from West Bengal which was designated pango lineage B1.1.526.

In addition to the SARS CoV2 research, ICMR-NICED also continued its regular research activities on other pathogens of public health importance. Interchangeability study on RotaVac and RotaSiil vaccines, showed that both vaccines can be used in an interchangeable manner without compromising their efficacy and safety. The findings were translated into policy decision for vaccine delivery by the India's Health Ministry. NICED also contributed in preparing a document on environmental dimensions of antimicrobial resistance in India under UNEP to inform policy decision for formulating National Action Plan (2023-2027) on AMR. Studies on evolution of *V. cholera* strains identified high virulence and cholera toxin production among Haitian variant strains. Studies on the changing pattern of dengue associated clinical manifestations identified gastrointestinal complications as key symptom of DENV2 infection. Genomic diversity studies on Hepatitis C virus identified emergence of Gen-4a in eastern India and Gen-1 and Gen-3 in Manipur.

NICED also continued its efforts towards translation research. Diagnostic assays for identifying multiple enteric viruses, nested PCR for identifying clarithromycin resistant *H. pylori* from biopsy samples, Lamp based assay for detection of Cholera was successfully developed and validated. Vaccine candidates against Shigella and Salmonella were developed and their immunogenicity was assessed in animal model. In addition, various plant based compounds have been identified and tested for antimicrobial activity against Shigella species, *H. pylori*, enteric parasites and rotavirus *in vitro* and *in vivo* animal model.

In this financial year, NICED has published 86 research articles with the average impact factor 8.66,with highest impact factor 168.9(2022). A total of 57 extramural projects funded by National/International agencies were being executed by the scientists.

In addition to research, NICED is also involved in capacity building in the field of biomedical research. A total of 70 PhD students, and 79 Master's students were trained. 143 healthcare workers were trained in 5 number of workshops in viral diagnostics, clinical research during 2021-22.

ICMR-NICED has been working on diarrhoeal diseases and other enteric diseases for the past 61 years. Now with the changing paradigm of diseases, NICED is committed to expand its research focus to new health problems in alignment with the National health priorities.

During this journey of ICMR-NICED, contributions of all the scientists, staff, students are noteworthy which enabled the institute to grow from strength to strength.

Shanta Dutta
Director

CONTENTS

S. Dutta (Principal Investigator), Bacteriology Division

Study on Carbapenem Resistant Gram-negative Bacilli of Enterobacteriaceae family isolated from blood of sepsis patients admitted in Intensive Care Unit of Tertiary care Hospitals in Kolkata

Project Investigator : Dr. Shanta Dutta, Scientist G & Director

Name of Student : Gourab Halder, (CSIR- SRF, PhD Student)

Bacterial Sepsis is prevalent in developing countries. Sepsis is a potentially life-threatening condition caused by the body's response to Blood stream Infection (BSI).Majority of sepsis cases are due to Multi Drug Resistant Gram Negative Bacilli (MDR-GNB) belonging to the Enterobacteriaceae family like *E.coli*, *Klebsiella* spp., *Enterobacter* spp., and non-fermenters like *Pseudomonas* spp., *Acinetobacter* spp.etc which are curable by antibiotics but increasing antimicrobial resistance is a threat for treatment. Currently Carbapenems, a class of β-lactam antibiotic reserved as "last-line" antibiotic group, which have the broadest spectrum of activity and the greatest potency against many aerobic and anaerobic Gram-positive and Gram-negative organisms are the choice of treatment for sepsis, but resistance to carbapenems are on the rise and is a serious health concern.

A total of 682 non-duplicate CR-GNB, isolated from three different tertiary care hospitals during January 2017-December 2021, were included in this study. Isolated CREs were identified by biochemical assays and confirmed by VITEK-2. Antibiotic Susceptibility Testing (AST) was performed using the Kirby Bauer disk diffusion method and Minimum Inhibitory Concentration (MICs) for the carbapenem group of antibiotics (Imipenem, Meropenem, Doripenem, Ertapenem) and colistin were determined according to the standard protocol. Metallo-β-lactamases were determined phenotypically by different test ssuch as Blue-Carba, Rapidec Carba and genotypically by PCR followed by Sanger sequencing. Carbapenemase resistance genes (ndm, kpc,and oxa48 like carbapenemase) as well as ESBL resistance genes (ctx-m, tem,and shv genes) were sequenced using the Big Dye 3.1 Cycle Sequencing Kit. Bacterial relatedness was determined by Pulsed-field Gel Electrophoresis (PFGE). Liquid mating assay was performed for checking the transferability of the AMR genes and plasmid profiling was done. Whole genome Shotgun sequencing (WGS) analysis was conducted by Oxford nanopore minion.

Among 682 CR-GNB, 569 isolates (83.43%), belonged to Enterobacteriaceae family. MIC90 of carbapenem for the CRE isolates were 512µg/ml and MIC90 of colistin was 128 µg/ml. Different tests for phenotypic detection of carbapenamase were compared. Among CRE (n=569) isolates, CR *Klebsiella pneumoniae* was predominant (n=447; 78.55%) and CR *E.coli* was (n=63; 11.05%. (Fig. 1) Among CR-*Klebsiella*, oxa48 like carbapenemase and tem1 were predominant (74.92% and 85.33% respectively). In CR *E.coli*, ndm1(46.66%) was predominant along with blaTEM-1(86.30%). Through Liquid mating assay, blaNDM-1and blaCTX-M-15 transferred through two different conjugative plasmids. WGS analysis showed the genetic environment of blaNDM-1 lies between IS91 family transposase and IS 26 family transposases. (Fig. 2)

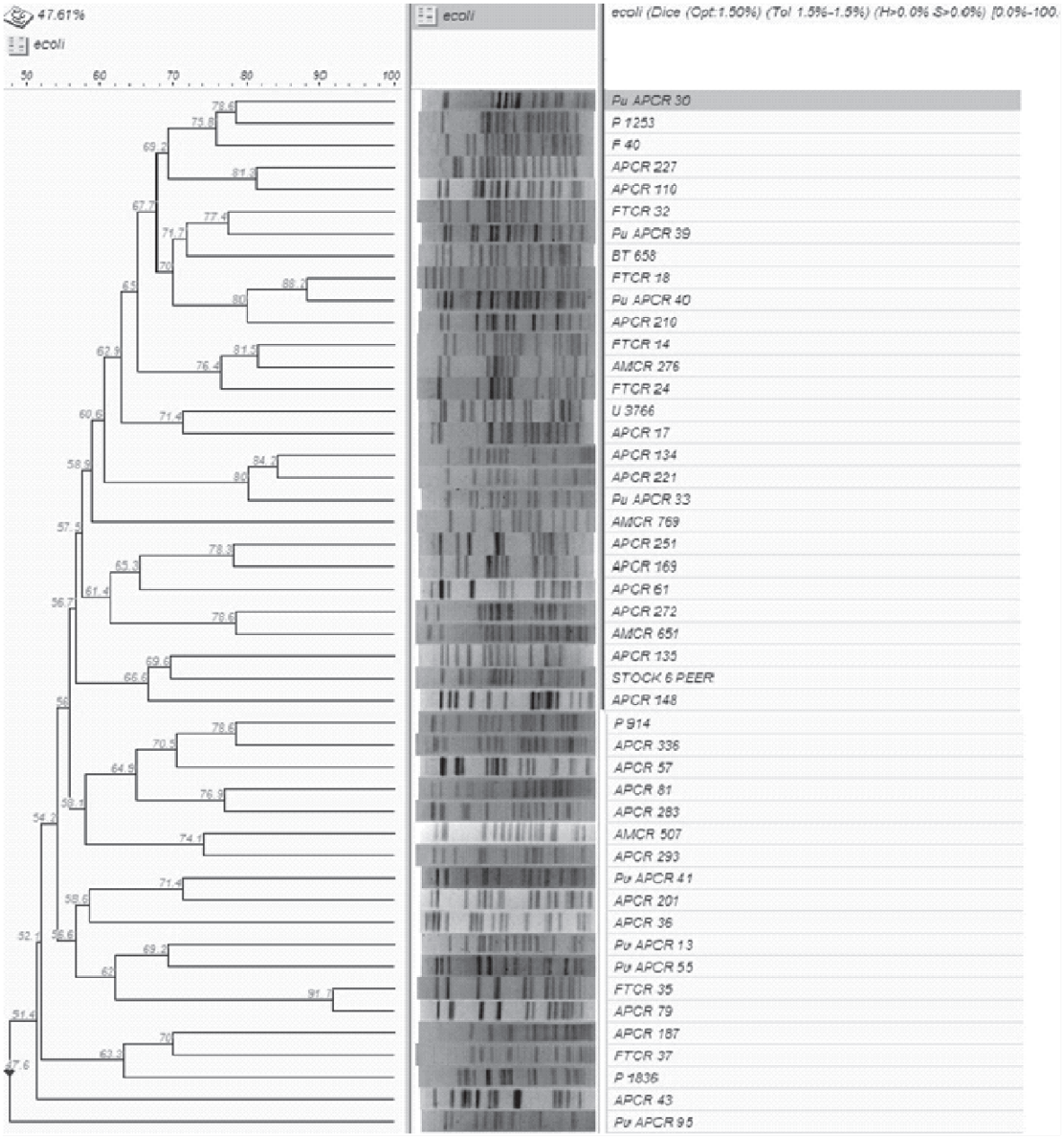

Fig 1 depicts Genetic relatedness of CR-*E.coli* isolates(n=47) from Kolkata during 2017-2021 by Pulsed-Field Gel Electrophoresis (PFGE). Dendrogram was constructed based on Dice's similarity co-efficient and UPGMA (the position tolerance and optimization were set at 1.5 and 1.5% respectively). More than 95% similarity in PFGE band pattern was interpreted as closely related while <80% similarity among the isolates were designated as unrelated.

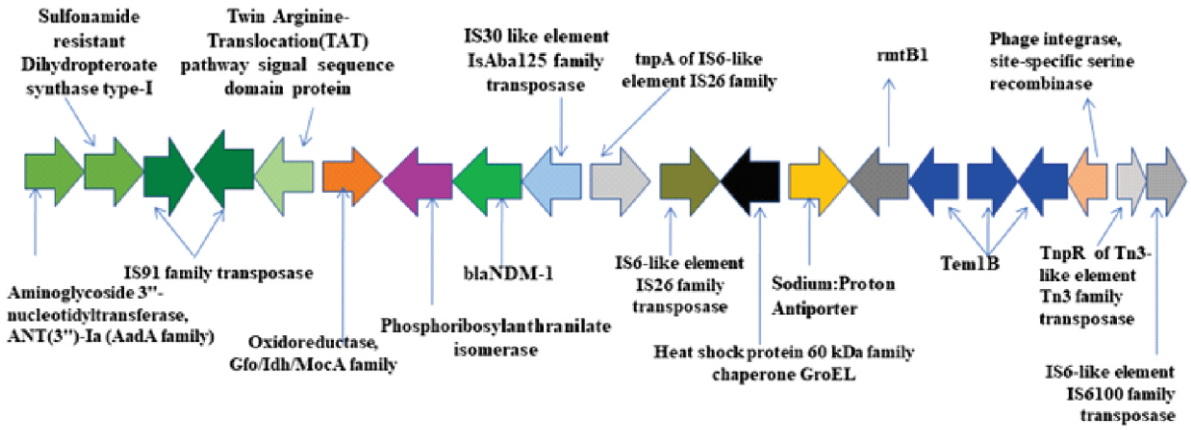

Fig 2 : Schematic representation of genetic environment of bla_{NDM-1} in *E. coli*.

Validation of antimicrobial activity of selected herbs against multidrug resistance *Salmonella* Typhi isolates; development of antityphoid herbal formulation

Project Investigator : Dr. Shanta Dutta, Scientist G & Director

Name of Co-investigator : Sunayana Saren (SRF-UGC, PhD Student)

Previously the crude extract of *Scoparia dulcis* root was fractionated into 13 fractions by column chromatography. Of 13 fraction 5 fractions were selected based on their antibacterial activity against *Salmonella* Typhi. Then on 43 compounds were identified from these 5 fractions by LCMS which was done at the National Institute of Pharmaceutical Education and Research (NIPER)-Kolkata. These 43 compounds were then computationally screened to state their drug likeness and it was found that 8 compounds violated the Lipinski's rule of five for druglikeness. The 35 compounds which followed the Lipinski's rule of five for druglikeness were computationally docked to some of the essential protein of *S.* Typhi viz. (1) Dihydrofolate reductase (folA), (2) UDP-N-acetylglucosamine 1-carboxyvinyltransferase (murA), (3) UDP-N-acetylenolpyruvoylglucosamine reductase (murB), (4) DNA polymerase III subunit epsilon (dnaQ), (5) DNA polymerase III subunit beta (dnaN). All test results were summarized in Table.1. The docking result showed folA, murB, murA proteins had highest docking score of -10.9, -8.89, -8.83 respectively with the compound (2R)-7-methoxy-2H-1,4-benzoxazin-3(4H)-one 2-O-β-galactopyranoside. The dnaQ protein had highest docking score of -8.25 with the compound Luteolin whereas the dnaN protein had highest docking score of -6.69 with the compound Tuberonic acid glucoside. The molecular dynamic (MD) of folA and murA proteins were performed with the top scoring compound in docking study i.e. (2R)-7-methoxy-2H-1,4-benzoxazin-3(4H)-one 2-O-β-galactopyranoside. In MD it was observed that both the protein and compound have showed certain level of stability during the 100 nsec stimulation time. The compound had highest interaction with 18th Asparagine amino acid of folA protein in form of H-bond and water bridge and with 329th Glutamic acid amino acid of murA protein in form of H-bond, ionic bond and water bridge (fig.3)

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Table.1: The list of identified compounds with their molecular formula, mass, druglikeness and docking score.

Serial No.	Name of the compound	Molecular formula	Mass (g·mol−1)	Drug-likeness	Docking Score				
					murA	murB	dnaQ	dnaN	folA
1	(2R)-7-methoxy-2H-1,4-benzoxazin-3(4H)-one 2-O-β-galactopyranoside	$C_{15}H_{19}NO_9$	357.1074	Yes	-8.83	-8.89	-6.78	-5.84	-10.9
2	3-hydroxy-6-methoxy-2-benzoxazolinone	C_8H7NO_4	181.0383	Yes	-3.64	-2.62	-4.15	-4.11	-7.71
3	4-epi-scopadulcic acid B	$C_{27}H_{34}O_5$	438.2394	Yes	1.66	8.07	-4.61	-3.58	-0.89
4	5,7,4′-trihydroxy-3′-methoxyisoflavone	$C_{16}H_{12}O_6$	300.0635	Yes	-5.9	-7.54	-6.1	-5.18	-8.79
5	6-methoxybenzoxazolinone	$C_8H_7NO_3$	165.0428	Yes	-3.02	-3.56	-5.3	-3.18	-5.75
6	Acacetin	$C_{16}H_{12}O_5$	284.0682	Yes	-4.78	-5.92	-5.65	-4.42	-6.91
7	Apigenin	$C_{15}H_{10}O_5$	270.0531	Yes	-4.58	-6.21	-5.87	-4.8	-7.07
8	Apigenin 6-C-pentosyl-8-C-hexoside	$C_{26}H_{27}O_{14}$	563.1356	No					
9	Apigenin 7-O-R-L-3-O-acetylrhamnopyranosyl-(1f6)-α-D glucopyranoside	$C_{29}H_{32}O_{15}$	620.1744	No					
10	Benzoxazine	C_8H_7NO	133.0835	Yes	-2.75	-3.13	-4.08	-3.32	-6.74
11	Benzoxazolinone	$C_7H_5NO_2$	135.0321	Yes	-3.07	-3.7	-4.83	-3.31	-6.01
12	Betulinic acid	$C_{30}H_{48}O_3$	456.3588	Yes	-	-2.18	-4.24	-2.58	-
13	Cirsiliol	$C_{17}H_{14}O_7$	330.0759	Yes	-5.98	-7.89	-6.7	-4.61	-10.1
14	Cirsimaritin	$C_{17}H_{14}O_6$	314.0816	Yes	-5.26	-6.8	-5.15	-4.54	-7.79
15	Coxicol	$C_9H_7NO_3$	177.0426	Yes	-3.25	-3.84	-3.61	-3.87	-7.1
16	Dulcidiol	$C_{27}H_{38}O_4$	426.2742	Yes	-0.98	-	-4.52	-3.87	-
17	Ferruginoside C	$C_{37}H_{50}O_{19}$	798.2939	No					
18	Gentisic acid	$C_7H_6O_4$	154.0264	Yes	-4.53	-5.42	-4.8	-4.64	-6.77
19	Ginsenoside F1	$C_{36}H_{62}O_9$	638.4403	No					
20	Glutinol	$C_{30}H_{50}O$	426.3855	Yes	-1.57	1.31	-3.98	-2.82	-1.84
21	Gonzalitosin I	$C_{18}H_{16}O_6$	328.0951	Yes	-4.2	-6.5	-5.33	-4.5	-7.27
22	Hexacosonol	$C_{26}H_{52}O_2$	396.3833	Yes	-1.5	-4.67	-	-3.3	-
23	Hydroxy-tetramethoxyflavone	$C_{19}H_{18}O_7$	358.1054	Yes	-4.71	-6.67	-4.51	-2.97	-6.16
24	Hymenoxin	$C_{19}H_{18}O_8$	374.1001	Yes	-4.58	-	-5.24	-3.7	-6.78
25	Ifflaionic acid	$C_{30}H_{46}O_3$	454.3452	Yes	-2.72	-2.32	-3.37	-3.28	-2.35
26	Isorhoifolin	$C_{27}H_{30}O_{14}$	578.1667	No					
27	Linarin	$C_{28}H_{32}O_{14}$	592.1793	No					
28	Luteolin	$C_{15}H_{10}O_6$	286.0589	Yes	-5.53	-7.28	-8.25	-5.22	-8.35
29	Nevadensin	$C_{18}H_{16}O_7$	344.0905	Yes	-4.1	-5.99	-4.5	-3.79	-6.8
30	Nicotiflorin	$C_{27}H_{30}O_{15}$	594.1619	No					
31	Nicotinic acid	$C_6H_5NO_2$	123.0673	Yes	-4.34	-4.24	-4.41	-3.49	-7.55
32	Palmitic amide	$C_{16}H_{33}NO$	255.2559	Yes	-1.26	-3.69	-4.77	-1.81	-3.37
33	P-coumaric acid	$C_9H_8O_3$	164.0468	Yes	-4.02	-5.36	-4.77	-4.23	-5.56
34	Scopadulcic acid A	$C_{27}H_{34}O_6$	454.242	Yes	-4.07	-	-5.85	-3.71	-
35	Scopanolal	$C_{27}H_{36}O_4$	424.2555	Yes	-3.44	-3.53	-4.89	-3.64	-4.33
36	Scoparic acid A	$C_{27}H_{36}O_5$	440.1864	Yes	-4.34	-3.81	-5.29	-3.77	-4.46
37	Scoparic acid B	$C_{25}H_{32}O_5$	412.2252	Yes	-3.83	-3.43	-4.87	-3.18	-4.74
38	Scoparic acid C	$C_{26}H_{32}O_5$		Yes	-2.51	-4.17	-5.31	-4.14	-6.37
39	Scoparic acid D	$C_{16}H_{26}O_4$	424.2238	Yes	-	-4.03	-4.62	-2.88	-
40	Stigmasterol	$C_{29}H_{48}O$	282.1785	Yes	-1.15	-1.61	-2.44	-2.72	-7.6
41	Trans Acteoside	$C_{29}H_{36}O_{15}$	412.3712	No					
42	Trihydroxyoctadecadienoic acid	$C_{18}H_{32}O_5$	624.2025	Yes	-1.09	-7.22	-6.5	-6.18	-10.58
43	Tuberonic acid glucoside	$C_{18}H_{28}O_9$	328.2244	Yes	-7.53	-8.86	-7.63	-6.69	-8.09

[- The compound did not dock with protein; the top docking scores for particular protein were highlighted in yellow.]

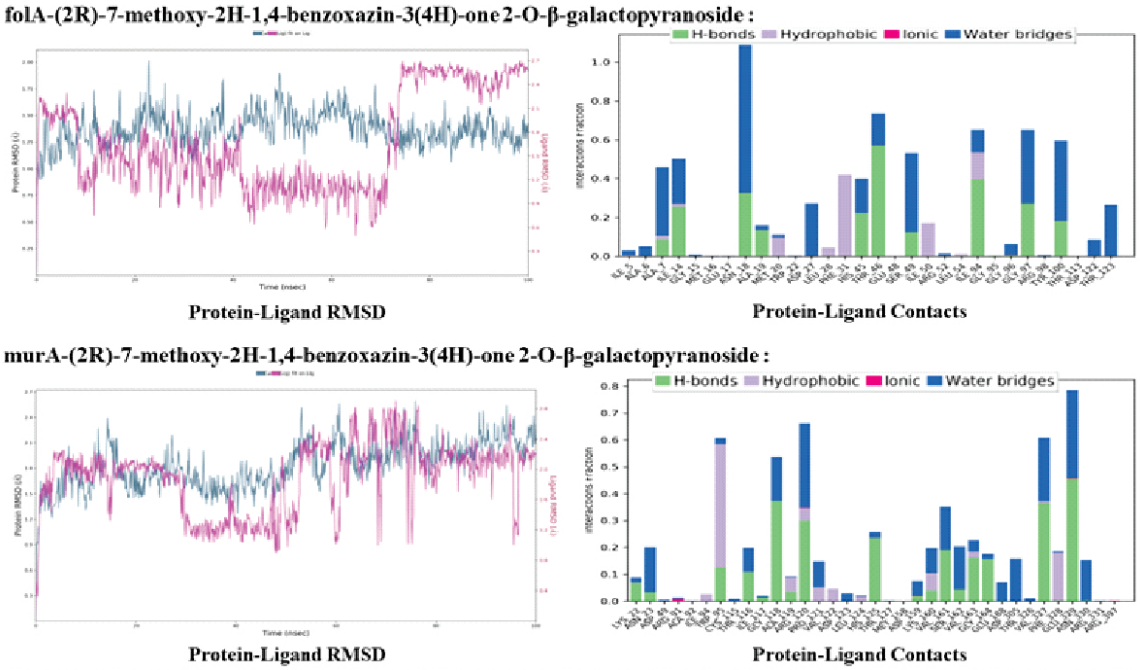


Fig3 : The outcome of Molecular dynamic study; left: the Root-Mean-Square Deviation (RMSD) of protein and ligand (compound), Right: the interaction fraction of compound with protein's amino acids

Molecular characterization of Non-typhoidal Salmonella isolated from clinical samples of patients with acute gastroenteritis, from Kolkata during Apr'21 - Mar'22

Project Investigator : Dr. Shanta Dutta, Scientist G & Director

Name of Co-investigator : Paulami Dutta (ICMR-SRF, PhD Student)

Emergence of antimicrobial resistant (AMR) non-typhoidal *Salmonellae* (NTS) contributes significant burden in healthcare system, mostly affecting the developing countries. As per the World Health Organization (WHO), Salmonella is a major zoonotic pathogen responsible for food-borne diseases, which can often be severe, especially among children. In this study, *S.* Kentucky (38.46%) is predominant followed by *S.*Typhimurium (23.07%) as observed during April 2021 to March 2022. An increase in the rate of resistance were observed in case of Ampicillin (46.15%) followed by fluoroquinolones (38.46%) & tetracycline (38.46%). Overall 30.76% Salmonella isolates are pan-susceptible. (Table 2)

Table 2: Percentage of antimicrobial resistance among isolated NTS (n = 13)

Antimicrobials (potency in µg)	Resistance (%)	Distribution of AMR among different *Salmonella enterica* serovars
NAL (30)	07; (46.15)	*S.* Kentucky - 5, *S.* Typhimurium – 1, *S.* Infantis – 1,
AMP (10)	06; (46.15)	*S.* Kentucky - 4, *S.* Infantis - 1
CIP (5)		05; (38.46) DCS 05, (38.46)S. Kentucky - 5,
TET (30)	05; (38.46)	*S.* Kentucky - 4, *S.* Infantis - 1
GEN (10)	04;(30.76)	*S.* Kentucky - 4,
NOR (5)	04;(30.76)	*S.* Kentucky - 4,
STR (10)	03; (23.07)	*S.* Kentucky - 3
AK (30)	03, (23.07)	*S.* Kentucky - 2
CAZ(30)	02;(15.38)	*S.* Kentucky - 2
SXT (25)	02; (15.38)	*S.* Kentucky - 1, *S.* Infantis - 1,
Resistance ≥ 1 antimicrobials	07;	*S.* Kentucky - 5, *S.* Typhimurium - 2
Resistance ≥ 3 antimicrobials (MDR)	06; (46.15)	*S.* Kentucky - 5, *S.* Infantis - 1

Samples received from Dr. B.C. Roy Hospital

» Total number of stool samples & rectal swab received from children < 5 years of age, attending the diarrheal treatment unit (DTU) at the OPD of Dr. B.C Roy Post Graduate Institute of Paediatric Sciences (a government paediatric hospital in West Bengal), Kolkata, India, Apr'21 – Mar'22: 749

» Number of Non-typhoidal *Salmonella* isolated: 13 (1.73%). (Fig.4)

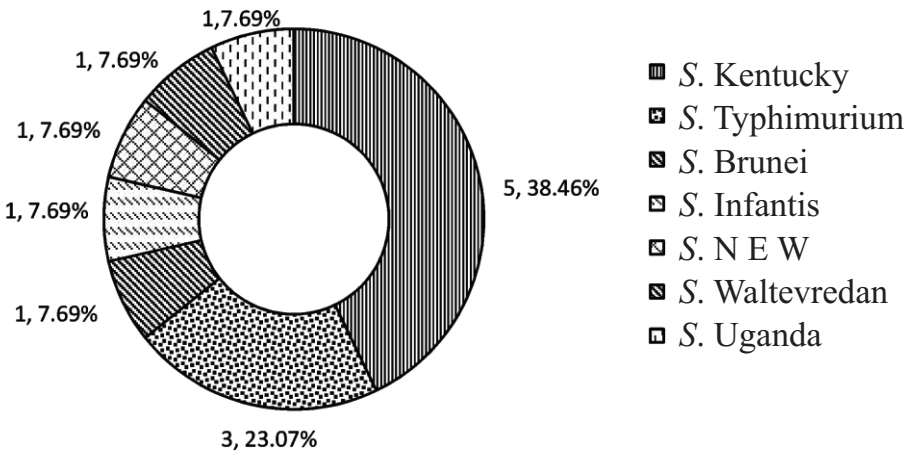


Fig.4: Distribution of NTS isolated from stools / rectal swabs received from B.C Roy hospital (n = 13)

In this study, we have noticed an increase in the frequency of isolation of MDR Salmonella Kentucky. The rates of isolation of MDR S. Kentucky are 5/13; 38.46% (OPD of Dr. B.C Roy Post Graduate Institute of Paediatric Sciences; a govt. Paediatric hospital in West Bengal). (Table 3)

Table 3: Characterisation of MDR Salmonellae isolated in this study from Apr'21 – Mar'22

Resistance profile	Serotype (No.)	Detection of Resistance gene	Plasmid type, size
ATeNaCNGSR	*S.* Kentucky (3)	blaTEM, tetA, aadA	-
ATeQNaGR	*S.* Infantis (1)	blaTEM, tetA	-
ATeQNaCNGAk3CAtAzR	*S.* Kentucky (1)	blaCTX-M, tetA,	-

*A=Amp, Te= Tetracycline, Na= Nalidixic acid, Q= Sulfamethoxazole/trimethoprim, C= Ciprofloxacin, N= Norfloxacin, G= Gentamicin, Ak= Amikacin, At= Aztreonam, Az= Azithromycin, 3C= 3rd generation cephalosporin

Sphingolipid as mediator in the interface of microbiome and host: implications in gut pathology

Name of Co-investigator : Sohini Sikder (CSIR-SRF, PhD Student)

The intestinal epithelium is a single barrier that keeps our body separated from the external environment, helps in digestion, developing immunity and providing niche to commensal bacteria. Structural disequilibrium of intestinal barrier leads to microbiome dysbiosis, inflammation, metabolic and autoimmune disorders. Sphingosine-1-phosphate is a bio active sphingolipid derivative and regulates cell survival, angiogenesis, innate and adaptive immunity, lymphocyte recirculation, and vascular permeability. S1P activates a family of G protein-coupled receptors, known as S1PR1–5. S1PRs and S1P are ubiquitously expressed and degraded by S1P lyase irreversibly. In this study we investigated the role of S1P in gut homeostasis mainly focusing on gut barrier regulation and immunity.

Aims and objectives :
Our study is primarily focused on the significance of S1P signalling in cell junctional integrity.

Methodologies :
Both *in vitro* and *in vivo*, S1P signalling was inhibited using pharmacological inhibitors i.e.- Dimethyl-sphingosine (DMS) and Fingolimod (FTY720). To examine the effect of DMS and FTY720 on epithelial cell integrity, Trans Epithelial Electrical Resistance (TEER) of HT-29 colorectal carcinoma cell was measured. Followed by western blot analysis and real time -PCR was done for the tight junctional proteins from HT-29 cells. For in vivo study, C57BL/6 mice were grouped into (i) control and (ii) FTY720 (3mg/ kg), and Immuno-histochemical (IHC) analysis of tight junction proteins were done from the colon sections.

Results:

1. **Trans-Epithelial Electrical Resistance (TEER) assay for epithelial barrier integrity assessment** (Fig 5)**.**

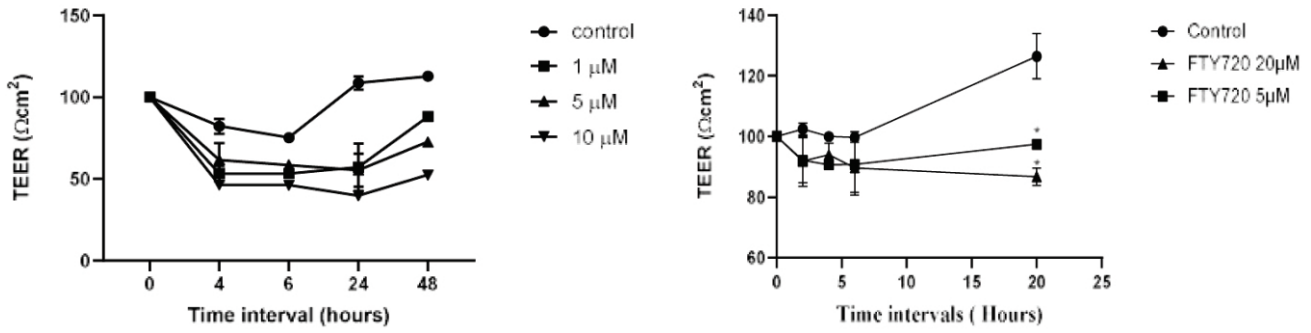


Fig 5 : Trans epithelial electrical resistance of HT-29 cell monolayer had decreased in both DMS and FTY720 treated groups.

2. **Western Blot analysis for Tight Junction proteins** (Fig 6)**.**

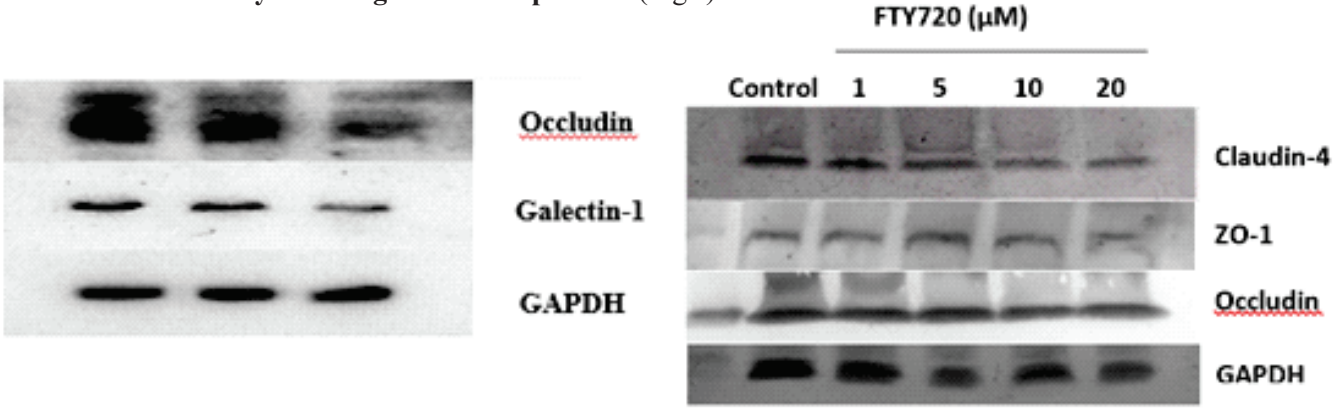


Fig 6 : Western blot analysis for tight junction proteins revealed that DMS treated cells had decreased Galectin-1 and Occludin levels. On the other hand, FTY720 treated cells had shown decreased Claudin-4 protein expression.

3. Real time- PCR analysis for Claudin-4 expression (Fig 7)**.**

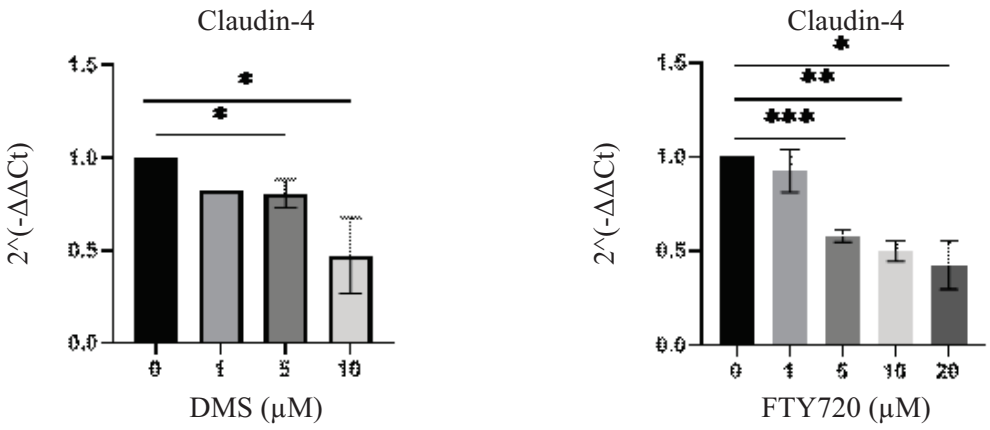


Fig 7 : Real time analysis of Claudin-4 expression has revealed that dose dependent decrease of Claudin-4 gene in both DMS and FTY720 treated HT-29 cells.

4. Real time PCR analysis and western blot analysis for tight junction proteins from siSphk-1 transfected HT-29 cells (Fig 8)**.**

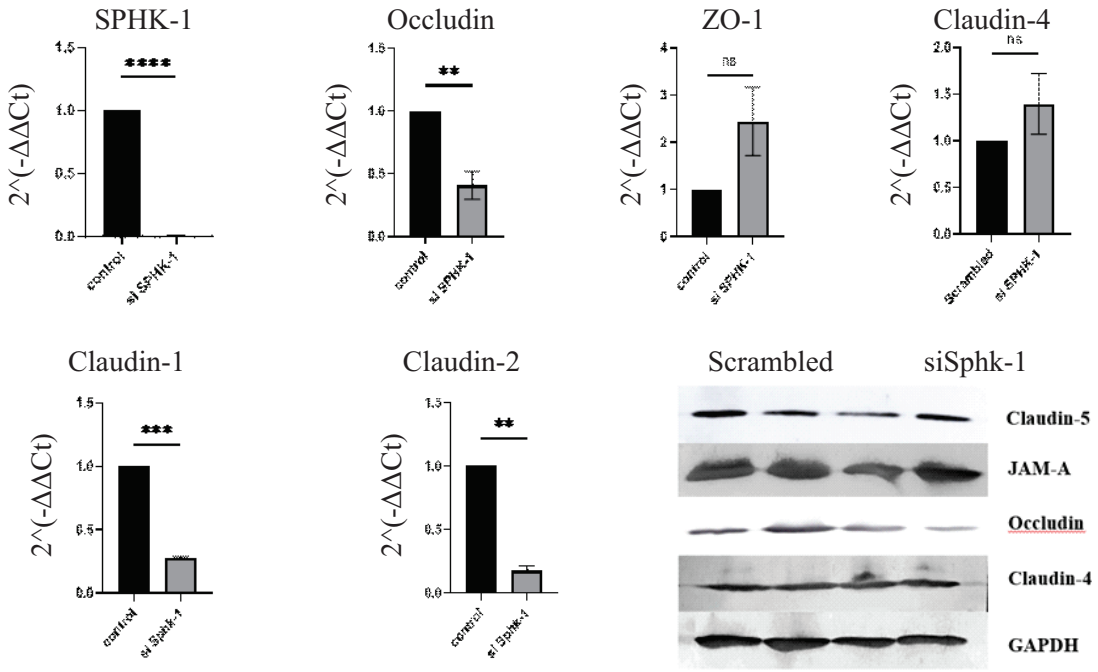


Fig 8 : Inhibition of S1P synthesis by using si Sphk-1 RNA, downregulates Occludin and claudin-1 proteins in HT-29 cells when analysed by both q-PCR and western bloting.

5. Realtime -PCR analysis of tight junction proteins from colon samples (Fig 9)**.**

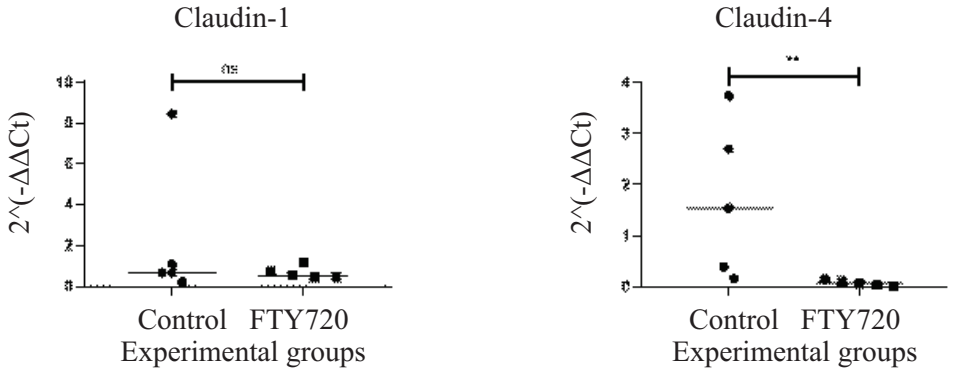


Fig 9 : Real time PCR analysis for Occludin and Claudin-4 from colon lysates of control and FTY720 fed mice shown significant downregulation of Claudin-4 proteins in FTY720 fed mice but no change in occludin level when compared to that of the control mice.

6. Immuno histochemical analysis for Claudin-4 expression from colon sections of control and FTY720 grouped mice (Fig 10)**.**

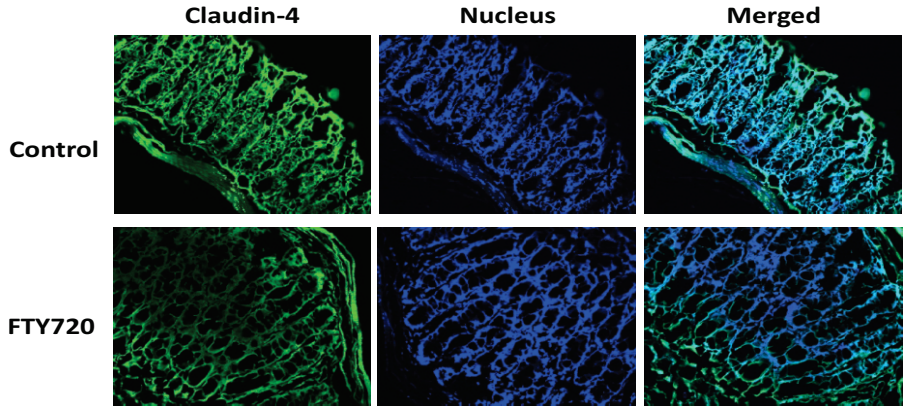


Fig 10 : IHC of colon sections of control mice and FTY720 fed mice were stained with anti-claudin-4 antibody and the data revealed that there is a decrease in Claudin-4 expression in FTY720 fed mice colon.

Discussion and conclusion:
From all these data, it is concluded that S1P plays an important role in tight junction protein synthesis and therefore it helps in barrier maintenance at the epithelial cell layer and inhibition of S1P synthesis as well as S1P signalling can leads to gut barrier disruption.

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

- International Symposium & Workshop on "One Health in India: Research informing biosafety, preparedness and response" organized by DHR/ICMR held on 12th April, 2021
- Web-Talk series organized by German Centre for Research and Innovation (DWIH) on Implications of COVID-19 on Health Care System on 13th April, 2021
- CHOLERA SEARO – Introductory discussions with WCOs on 14th April, 2021
- WHO Stakeholder Consultation on enteric fever disease burden (Session 1) held on Wednesday, 21 Apr 2021
- Course on the COVID-19 response in India focusing on the impact of both direct and indirect effects of the virus epidemic across the country on women and children's health and wellbeing organized by Johns Hopkins Bloomberg School of Public Health, USA on 23rd April, 2021
- A virtual symposium on "Ensuring immunization for all in the context of COVID-19" organized by PGIMER, Chandigarh with support of GHS and IVAC during 24-25 April, 2021
- The Surveillance and Epidemiology of Drug-resistant Infections Consortium (SEDRIC) meeting Session-1 on "A new era for surveillance of drug resistant infections: recent developments and outlook for the future!) to be held on 29th April 2021

- WHO Stakeholder Consultation on enteric fever disease burden (Session 2) held on Wednesday, 4th May, 2021
- Global Typhoid Genomic Consortium Webinar held on 12th May, 2021
- GTFCC-WHA side virtual event: "Evidence to Actions - Countries and Communities Driving Adaptive, Evidence-Informed approaches to End Cholera" held on 20th May, 2021
- IVAC: Addressing challenges in vaccination in fragile contexts: What are the perspectives under IA2030 held on 21st May, 2021 at 5.00 pm
- 35th Science, Technology and Innovation Policy (STIP) Forum Lecture series on Covid-19: Urgent need beyond the ICU, the hospital and the short-term by Dr. Amitava Banerjee, Associate Prof in Clinical Data Science, University College London (UK) on 25/05/2021
- 8th Annual Meeting of the Global Task Force on Cholera Control (GTFCC) held from 8th to 10th June, 2021
- National webinar on "Body's fight against harmful invaders: How we fight Corona virus and for how long? Jointly organized by INSA Kolkata Chapter and Kharagpur College (IQAC & UBA Unit) on 9th June, 2021.
- WHO Stakeholder Consultation on enteric fever disease burden (Session 4) held on Wednesday, 6th July 2021
- Panel Discussion on Building Post Covid-19 Economic Resilience in Asia and Pacific organized by Research and Information System for Developing Countries on 29/07/2021.
- Physically attended an expert consultation meeting titled "Consolidating the Evidence, Building the Future: Consultation meeting on Integrated and Enhanced Epidemiology Under the National AIDS Control Programme in India" organized by NACO during 27-29th August 2021 at Delhi
- Delivered a talk on "Second Wave of Covid-19 Pandemic in India: Challenges in Management and Prevention" at the webinar organised by Dept. of Zoology, Jhargram Raj College, Jhargram held on 3rd September, 2021.
- Attended as guest speaker at the PRERNA (Platform for Research Excellence Related to National Aims) young investigator science meeting with the theme - "Leveraging environmental surveillance of wastewater to inform human disease epidemiology" held during September 7-9, 2021.
- Symposium on "Society in Transition: Impacts of the Pandemic" organized by German Centre for Research and Innovation (DWIH), New Delhi, held on 8th September, 2021
- Attended as a Panelist for panel discussion on "Role of lab automation in improving diagnostics operations" at the 2nd Elets Diagnostics Leadership Summit held on 23rd September 2021
- Delivered a talk on "Contributions to science by Indian women – the personal journey" on 8th October, 2021 organized by the Molecular and Cellular Biology Laboratory, ICMR-NIRRH, Mumbai on the occasion of Navratri celebration.
- Addressing at the "4th Globalised Education Forum (GEF)" on "The impact of COVID on education system and the need and importance of Medical education/Paramedical education/ Research as post pandemic career opportunities" held on 23rd October 2021, at Taj Bengal Kolkata.
- WHO Enteric Fever BOD Stakeholder Consultation 5 held on 27/09/2021
- World Pneumonia Day Panel Event organized by International Vaccine Access Centre (IVAC), JHU: The Future of Pneumonia Prevention: Building on the Success of Vaccines held on 11/11/2021
- Launching of book "Going Viral" by Balaram Bhargava, Director General, ICMR published by Rupa Publications India and followed by Panel Discussion on 23/11/2021
- The Tripartite Plus (FAO, OIE, WHO and UNEP) organized a one-day webinar on "AMR Journeys, Stories of AMR Champions of Asia" as part of World Antimicrobial Awareness Week 2021, on 24 November 2021
- Indo-German Science & Technology Centre (IGSTC) launching the Women Involvement in Science and Engineering Research (WISER) programme on 24/11/2021
- "11th International conference against Typhoid and other invasive salmonelloses" held on 6-8 Dec 2021 organized by Sabin Vaccine Institute.
- Webinar on "Unpacking the environmental dimensions of AMR in food and agriculture" on 14/12/2021 organized by FAO and UNEP
- Web seminar: Fireside Chat: Pandemics and Equity" organized by the German Centre for Research and Innovation – DWIH New Delhi on 24th January, 2022
- 3rd COVID-19 Global Research and Innovation Forum" hoisted by WHO on 24-25 February 2022
- GTFCC Surveillance Subgroup: Cholera Elimination on 28th February, 2022.
- 7th Meeting of the Global Task Force for Cholera Control (GTFCC) – WASH Working Group 9-10 March, 2022
- Fourth Meeting of the NACO's Technical Working Group Surveillance & Epidemiology (S&E) Meeting virtually held on 7-8th March 2022
- Attended physically the Consultation of National Expert on the National Action Plan on Antimicrobial Resistance 2022-2025 (Animal Health Sector) organized by FAO-India held on 23-24 March, 2022
- WHO consultation on COVID vaccines research: Advancing the development of pan-sarbecovirus vaccines on March 25, 2022
- One day workshop-cum training session on the FoodNet Digital Platform held on 31/03/2022 at C-DAC, Kolkata

Patent(s) filed/accepted /Technology developed

Patent title : "Development of a safe and cost-effective universal Shigella immunogen"
Year of application : August 31, 2021
Patent filed at : Indian Council of Medical Research, New Delhi

Patent title : "Cost Effective Bivalent Typhoidal Bacterial Ghost (BTBG) Antigen based vaccine against Typhoidal and Para-typhoidal salmonellae"
Year of application : December 17, 2021
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-UGC
Ms. Sohini Sikder, SRF-CSIR
Ms. Poulami Dutta, SRF-ICMR
Ms. Arunima Sengupta, Project Research Assistant

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

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

Loop-mediated isothermal amplification (LAMP) assay has been developed for detection of *Vibrio cholerae* O1. Newly developed assay is working with 100% sensitivity and specificity when tested with pure cultures of *V. cholerae* O1 as positive detection and other vibrios and *Escherichia coli* strains as negative detection.

Serosurvey: an estimation of *Vibrio cholerae* O1 infection in India. Serological imprint of *V. cholerae* O1 infection in the previous one year reflects through reciprocal vibriocidal titer ≥ 320. Vibriocidal titer ≥ 320 was used as a surrogate marker to predict 'Recent Annual Infection' using archived sera collected through nationwide Dengue sero-surveillance conducted during June 2017 to April 2018. Triangulation of vibriocidal data with epidemiological data on cholera cases during that period showed a close match. Therefore, it may be said that sero-surveillance using vibriocidal data can be used to estimate cholera infection status in the preceding year and may be considered as an effective alternative of disease surveillance.

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

- Webinar: Advance Course on Preventive Vigilance by National Productivity Council during July 6-7, 2021
- Online Training: Two half-days e-Learning Capacity Building Programme on General Financial Rules 2017 organized by National Productivity Council during July 28-29, 2021
- Online Workshop: Advanced bioinformatics analysis to mine AMR and virulence information from high-throughput sequencing data by Christian Medical College, Vellore during Aug 12-14, 2021
- Online Training: Good Governance and Transparency through RTI Act 2005 by National Productivity Council during Sep 9-10, 2021
- Webinar: Open Science: a multi-faceted framework to improve science and health outcomes by ICMR and Elsevier on Oct 29, 2021

Awards/ Honours received

Fellow of the West Bengal Academy of Science and Technology (WAST); Conferred on May 7, 2021 AGB of WAST

PhD Awarded:

Name: Smt. Taniya Golder
Thesis Title: Gene Regulation and Expression of Virulence Factors of Pathogenic *Vibrio cholerae*
University:University of Calcutta, Kolkata
Date of Degree:December 6, 2021

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

Regulation of cholera toxin promoter activity based on the number of TTTTGAT heptamer repeats by H-NS and ToxT in *Vibrio cholerae* O1

Toxin-coregulated pilus (TCP) and choleragen produced by pathogenic strains of *Vibrio cholerae* are the major contributing factors to *V. cholerae* colonization and pathogenicity. A complex virulence-regulatory cascade controls expression of the cholera toxin genes (ctxAB) in *V. cholerae*, which eventually leads to the production and secretion of choleragen (CT), responsible for rice watery diarrhoea in infected individuals. The cholera toxin promoter (PctxAB) contains a series of heptad repeats (5' -TTTTGAT-3'), which has previously been shown to play a crucial role in transcriptional regulation of ctxAB by recruiting the transcriptional activators ToxT, ToxR and the nucleoid-associated protein H-NS along the ctx promoter. The number of these repeats differs not only between the two biotypes of *V. cholerae* O1 strains, but also among the strains belonging to the same biotype. In this study, we examined if regulation of PctxAB is influenced in any way by the number of these repeats.

β-galactosidase assay study using fusions plasmids demonstrated that promoter activities of the fusion plasmids dropped gradually as the number of the TTTTGAT heptad repeats increased within the PctxAB::lacZ fusion plasmids indicating PctxAB activation inversely correlates with the number of the heptad repeats (Fig11). Based on our observations, we posit that ctx activation indeed depends on the number of TTTTGAT heptad repeats within PctxAB, and occupation of the distal repeats by H-NS could prevent transcriptional activation of the ctx genes in *V. cholerae* O1 pandemic isolates. Our observations from promoter activity experiments also raised the possibility that complete displacement of H-NS by ToxT may not be necessary for transcriptional activation by ToxT, and the degree of H-NS displacement from PctxAB under virulence inducing conditions (hence in the presence of active ToxT) could depend on the number of direct repeats within the regulatory region upstream of the ctx genes (Fig12). Our results elaborate on the interplay between ToxT and H-NS and suggest that ToxT-dependent transcriptional activation may not require entire displacement of H-NS and supports a recently described revised model of ToxT and H-NS mediated PctxAB transcriptional regulation.

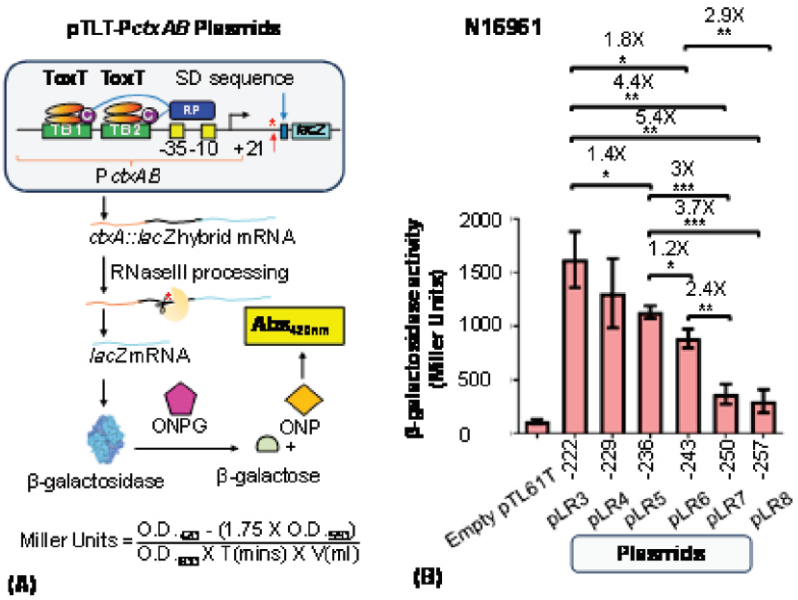


Fig 11: β-galactosidase assay for measuring PctxAB activity. (A) Schematic representation of β-galactosidase assay with ctx::lacZ fusion constructs. All of these fusion plasmids contained an RNaseIII processing site between the multiple cloning site (MCS) and the lacZ gene, thereby allowing cleavage of the ctx::lacZ hybrid mRNA (as presented here schematically with orange representing ctx-specific and cyan representing lacZ-specific regions) and producing lacZ mRNAs with consistent 5' end. This crucial feature ensured independent translation of lacZ irrespective of the sequences fused upstream (Linn and Pierre 1990). The cleavage site is indicated by a red asterisk. TB1 and TB2 (green boxes) represent toxbox 1 and toxbox 2, respectively. ToxT molecules are recruited at the toxboxes and interact with the RNA polymerase (RP, blue box) C-terminal domain (C, purple circle). -35 and -10 core promoters are represented with yellow boxes. TSS is represented by the bent arrow. Bacterial strains were grown under specific growth conditions, as mentioned in Materials and Methods, and tested for their abilities to produce β-galactosidase from the ctx::lacZ fusion constructs. β-galactosidase assays were performed according to the methodology previously described (Miller 1972) using O-Nitrophenyl-β-D-Galactopyranoside (ONPG, Sisco Research Laboratories Pvt. Ltd, India, 66398) substrate

solution. (B) Measurement of PctxAB activity from ctx::lacZ fusion plasmids in *V. cholerae*. Overnight-grown recombinant strains of WT N16961 (hns+toxT+) harboring the pTL61T plasmid or its derivatives were subcultured into fresh medium (AKI +HCO3) and incubated at 37◦C for 3 hours. Bacteria were mixed with chloramphenicol and cooled on ice for 20 minutes. In the meantime, O.D. 600 nm values were recorded. β-galactosidase hydrolyzes the substrate ONPG, releasing o-nitrophenol (ONP), which is yellow in color and absorbs 420 nm light. β-galactosidase activity was measured in Miller units (MU) and the mean values of at least three individual experiments were plotted using GraphPad PRISM (V. 8.0). Error bars indicate the standard deviation for each group. Asterisks indicate the statistical significance of the data determined by two-tailed student's t-test (∗P < .05, ∗∗P < .005, ∗∗∗P < .0005). "X" indicates the fold difference in MU between the indicated strains. The 5 ends of the PctxAB::lacZ fusions and the number of the TTTTGAT heptad repeats within them are indicated along the x-axis over the respective reporter plasmids. The blue circular rectangle indicates the pLR plasmids used in this study.

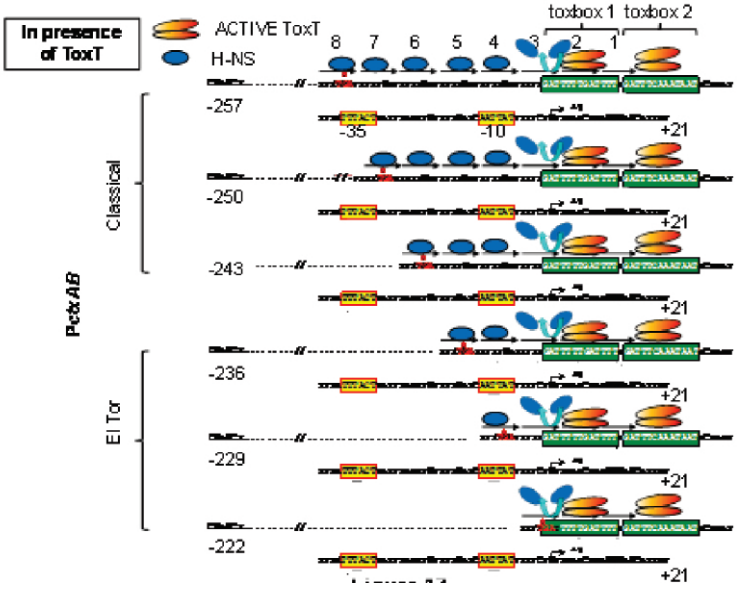


Fig12: Proposed revised model of PctxAB transcriptional regulation. The model for transcriptional activation El Tor and classical PctxAB regions (starting from +21 with 5' end up to -257) in *V. cholerae* pandemic strains is summarized. The ToxT-binding sites are indicated by green boxes. The green bent arrow represents the transcription start site. Putative -10 and -35 core promoter elements are highlighted within yellow boxes with red borders. The red asterisk indicates the TGA stop codon of the zot gene. TTTTGAT heptad repeats are marked with black arrows. In the absence of ToxT-dependent activation, H-NS utilizes the heptad repeats and polymerizes along the A/T-rich sequences within PctxAB. Under virulence-inducing conditions, active ToxT binds to the toxboxes and displaces H-NS monomers (displacement is indicated by the curved arrow) from the TTTTGAT sequence in and around toxbox 1, although the distal repeats remain bound to H-NS and partially repress ctx expression. This model is supported by the data obtained from our genetic experiments with *V. cholerae* and *E. coli* strains,

Exploration of diarrhoeagenic *Escherichia coli* isolated from hospitalized diarrhoeal patients in Kolkata (2012–2019)

Diarrhea is the second leading cause of child death at the global level and third leading causes of child mortality in India. Overall, this disease kills almost 2.5 million people each year globally and 70% of them are under 5 years of age. The causative agents belong to the broad group of intestinal pathogens, which includes bacteria, viruses and parasites. Among them rotavirus, calcivirus and diarrheagenic *Escherichia coli* (DEC) accounted for more than half of the diarrheal deaths worldwide. In India, 30-40% of all diarrheal episodes are generally found to be associated with DEC infection. Therefore, DEC has been considered as the leading diarrheal pathogen and needs a constant surveillance to understand the disease causing property and their antimicrobial resistance.

The prevalence and antimicrobial resistance (AMR) of major diarrheagenic *Escherichia coli* (DEC) pathotypes detected in hospitalized diarrheal patients in Kolkata, India, during 2012-2019 were analysed. A total of 8,891 stool samples were collected from the Infectious Diseases Hospital, Kolkata and screened for the presence of enteric pathogens. Multiplex-PCR identified the presence of DEC in 7.8% of the samples, in which ETEC was most common (47.7%) followed by EAEC (38.4%) and EPEC (13.9%). About 54% cases were due to sole DEC infections. Majority of the mixed DEC infections was caused by the *Vibrio* spp. (19.1%) followed by Rotavirus (14.1%) and *Campylobacter*

spp. (8.4%). ETEC and EAEC were associated significantly with diarrhea in children <5 years of age, whereas EPEC and also ETEC were prevalent in patients aged between 5 and 14 years (Fig13). AMR profile showed high prevalence of multidrug resistance (MDR) among DEC (56.9%) in which 9% were resistant to antibiotics of six different antimicrobial classes (Fig 14 and 15). Screening of the AMR conferring genes of DEC showed the presence of blaCTX-M3 (30.2%) in highest number followed by blaTEM (27.5%), tetB (18%), sul2 (12.6%), strA (11.8%), aadA1 (9.8%), blaOXA-1 (9%), dfrA1 (1.6%) and blaSHV (1.2%) [Table 4].

These findings highlighted the high prevalence of MDR in major DEC pathotypes that could be considered as the leading etiologic bacterial agent responsible for diarrhea and suggests a significant public health threat. The results of this study can help to improve the understanding of the epidemiology of DEC infections in patients with diarrhea. Monitoring of AMR surveillance needs special attention because the DEC isolates were highly resistant to commonly used antimicrobials in the treatment of diarrhea.

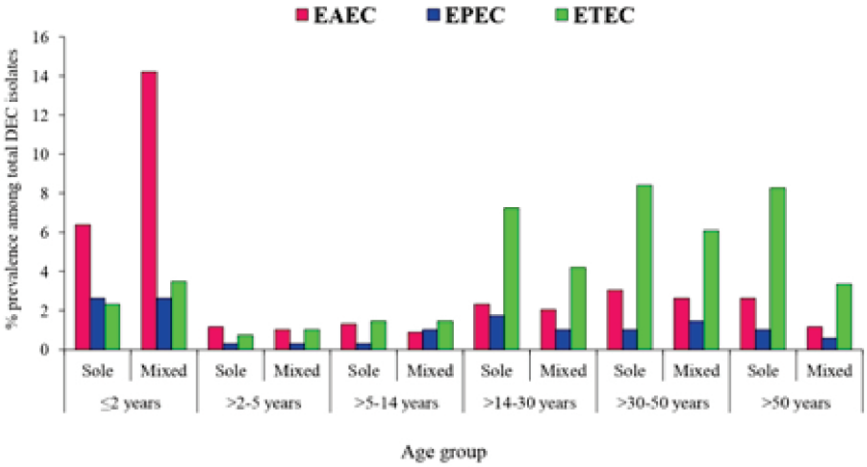


Fig13 : Sole and mixed pathogenic distribution of different DEC pathotypes according to the age groups of the infected patients. Figure shows high prevalence of EAEC sole and mixed infections in age group ≤ 2 years. ETEC shows a higher prevalence in older age groups.

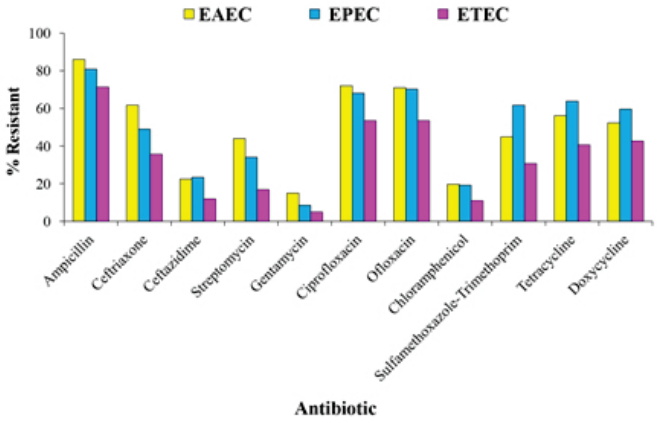


Fig14 : Antimicrobial resistance pattern of different DEC pathotypes isolated in Kolkata during 2012 to 2019.

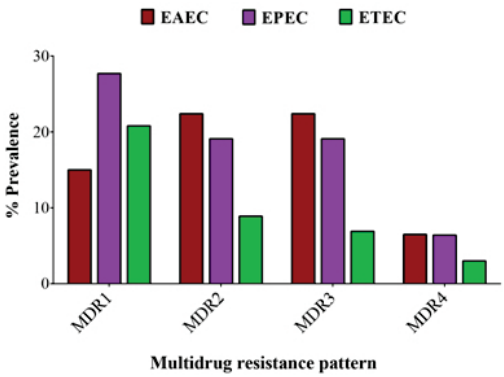


Fig15 : Multidrug resistance profile of different DEC isolates of Kolkata. MDR1, MDR2, MDR3 and MDR4 represent the strains those are resistant to at least 3, 4, 5 and 6 different classes of antimicrobials, respectively. Higher prevalence of MDR phenotype was found in EPEC isolates compared to other DEC pathotypes.

Table 4 : Prevalence of antimicrobial resistance-conferring genes among the resistant EAEC (n=107), EPEC (n=47) and ETEC (n=101) isolates.

Confers resistance to	Genes	No. of EAEC (%)		No. of EPEC (%)		No. of ETEC (%)	
Beta-lactams	bla_{TEM}	28	(26.2)	12	(25.5)	30	(29.7)
	bla_{OXA-1}	17	(15.9)	6	(12.8)	0	(0.0)
	bla_{CTX-M}	33	(30.8)	14	(29.8)	30	(29.7)
	bla_{SHV}	1	(0.9)	0	(0.0)	2	(2.0)
Sulfonamides and trimethoprims	*sul 2*	18	(16.8)	11	(23.4)	3	(3.0)
	dfrA1	1	(0.9)	1	(2.1)	2	(2.0)
Streptomycin (Aminoglycoside)	*strA*	16	(15.0)	9	(19.1)	5	(5.0)
	aadA	22	(20.6)	1	(2.1)	2	(2.0)
Tetracyclines	*tetB*	19	(17.8)	17	(36.2)	10	(9.9)
Quinolones	*qnrB*	4	(3.7)	2	(4.3)	3	(3.0)
	qnrS	12	(11.2)	7	(14.9)	17	(16.8)
	aad6'-Ib-cr	11	(10.3)	1	(2.1)	0	(0.0)
Chloramphenicols	*catI*	3	(2.8)	5	(10.6)	3	(3.0)

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

- Participated to online conference on "Platform for Research Excellence Related to National Aims– PRERNA" and delivered a lecture on "Environmental surveillance – perspectives from the field and the laboratory" organized by Christian Medical College, Vellore during September 7-9, 2021.
- Participated to an online 2nd International Webinar Series and Delivered a talk on "Reconnaissance of Enigmatic Gastric Pathogen *Helicobacter pylori*: Distinct genetic traits, therapy and the gut microbiome" on Sept 04, 2021 organized by Department of Home Science, University of Calcutta, Kolkata during during September 1 to 6, 2021.
- Participated to an online International Conference entitled "Revealing a new paradigm of Biology in the 21st century: A Cellular and Molecular approach" and Delivered a talk on "Enigmatic gastric pathogen Helicobacter pylori and the gut microbiome" organized by Amity Institute of Biotechnology of Amity University, Uttar Pradesh during April 8-9, 2021.
- Involved as a Faculty in Organizing a "Hands-on Laboratory Training Workshop on Foodborne Pathogens Survey in North-East India" organized by ICMR-NICED during March 28-30, 2022 and delivered a talk on "Isolation and identification of common enteric pathogens with monitoring Antimicrobial Resistance". 15 participants from North-East Inia participated in this training programme.

Post and Pre-Doctoral Fellows:

Post-Doctoral Fellows:
Dr. Gautam Chowdhury, PDF-OUP
Dr. Tanmoy Dey, PDF-NASI

Pre-Doctoral Fellows:
Mr. Bipul Chandra Karmakar, SRF-DST INSPIRE (Till Aug 2019); RA(Since Sept 2019)
Mr. Prosenjit Samanta, SRF-CSIR
Ms. Sangita Paul, SRF- CSIR
Ms. Debjani Ghosh, SRF-CSIR
Ms. Sreeja Shaw, SRF-CSIR

S. Basu (Principal Investigator), Bacteriology Division

Colistin resistance in neonatal septicaemic strains: two-component systems, efflux pumps, lipopolysaccharide modification

Colistin, a cationic antibiotic, exerts bactericidal activity by destabilizing LPS. Modification of LPS by two-component system (TCS) genes (phoP/phoQ and pmrA/pmrB), mgrB (negative regulator of phoP/phoQ), efflux pumps, their regulators, lipid A biosynthesis and assembly genes, all contribute to colistin resistance. The use of colistin has recently increased as other options are becoming limited. Considering colistin as a 'last resort' antibiotic, this study aimed to decipher the trend of colistin susceptibility among septicaemic neonatal strains and analyse the different mechanisms of colistin resistance among strains with/or without carbapenem resistance. Colistin resistance was found in K. pneumoniae (2.8%) only, of all Enterobacterales studied. The transmissible colistin resistance gene, mcr, was absent. Colistin-resistant *K. pneumoniae* belonged to diverse sequence types (ST14/37/101/147/716) and exhibited multiple mechanisms of colistin resistance including overexpression of the two-component systems (TCS) (phoP/Q, pmrA/B), and AcrAB-TolC pump and its regulators (Fig 16) Mutations in TCS, mgrB,pumps, repressors, and lipopolysaccharide-modifying genes were detected. Phylogenomic comparison revealed that this global collection of colistin-resistant K. pneumoniae was diverse, with the presence of epidemic and international clones (Fig17). Mutations in mgrB and TCS noted in global strains were comparable to the study strains. Co-occurrence of carbapenem resistance (n=61, 87%) was observed in global strains. Co-existence of dual carbapenemases (blaNDM-5/blaOXA-48,181) in multiple lineages within different replicons was found in neonatal colistin-resistant study isolates only.

Colistin resistance both in study and global strains is multifaceted and attributed to mutations in chromosomal genes leading to lipopolysaccharide modification or efflux of colistin through pumps. With no transmissible mcr, prevalence of colistin-resistant strains was low in the unit. Colistin-resistant strains with dual carbapenemases causing sepsis are alarming as they are practically untreatable.

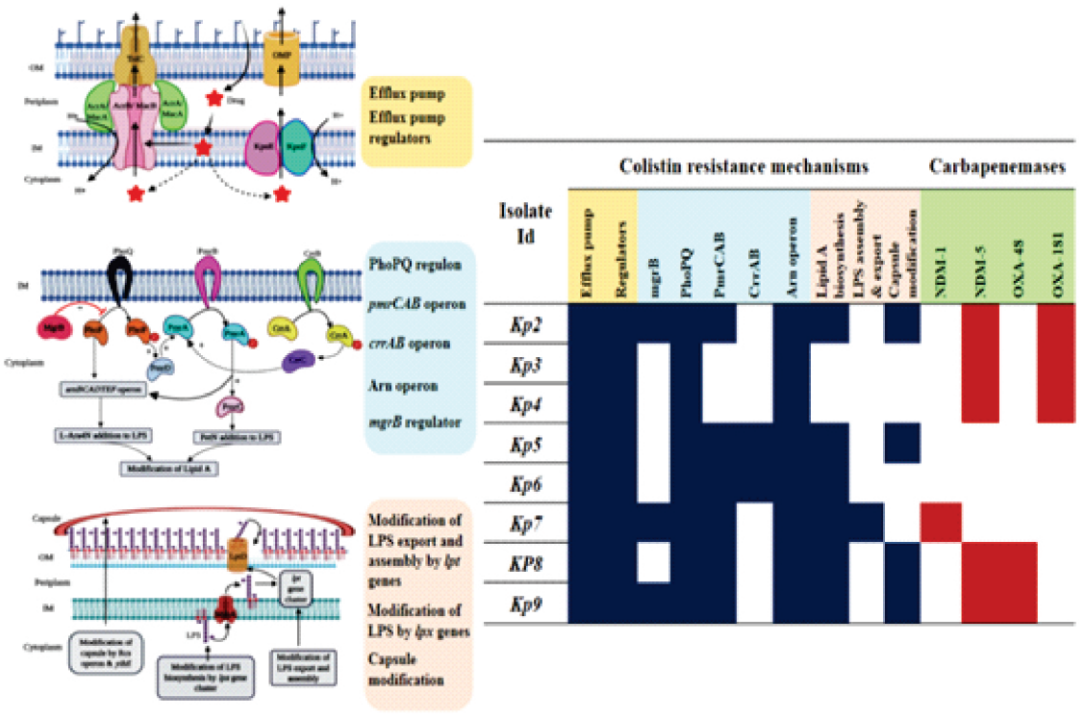


Fig 16 : Schematic diagram depicting multidimensional resistance mechanism for colistin exhibited by study strains co-harbouring different carbapenemases.

Abbreviations : Kp, *Klebsiella pneumoniae*; outer membrane, OM; inner membrane, IM. Colistin resistance mechanisms (with mutation/ and or overexpression) has been expressed as blue heatmap, while carbapenem-resistant genes has been depicted as red heatmap.

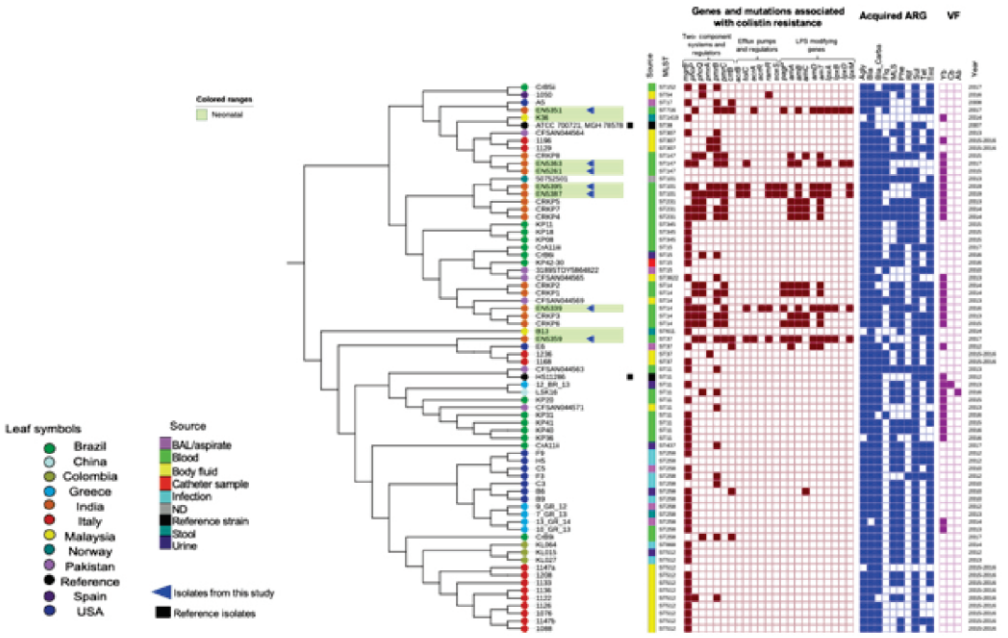


Fig 17 : Phylogenomic analysis of genome sequenced *Klebsiella pneumoniae* strains across the globe reported to harbor chromosomal colistin resistance.

The phylogeny consisted of 72 *K. pneumoniae* with 70 colistin-resistant *K. pneumoniae* and two *K. pneumoniae* reference strain. The leaf symbols are coloured according to the country of origin and the green coloured ranges indicate isolates from neonates, a blue triangle denotes isolates from this study, and a black square indicates reference strains included. The source of each isolate is denoted by a colour strip following the dendrogram. Following the MLST text, are three gene clusters with presence/absence heatmaps; genes and mutations associated with colistin resistance (red), acquired antimicrobial resistance genes (blue) and virulence associated genes (purple).

Abbreviations : multi-locus sequence typing (MLST); sequence type (ST); antimicrobial resistance genes (ARGs); virulence factors (VFs); not determined (ND); aminoglycosides (Agly); β-lactam (Bla); carbapenemases (Bla_Carba); fluoroquinolone (Flq); macrolide-lincosamide-steptogamin B (MLS); phenicol (Phe); rifampicin (Rif); sulphonamide (Sul); tetracycline (Tet); trimethoprim (Tmt); yersiniabactin (Yb); colibactin (Cb); aerobactin (Ab).

Effect of novel mutations within AdeRS, the regulator of AdeABC efflux pump, in carbapenem-resistant *Acinetobacter baumannii*: an in-silico approach

Resistance-Nodulation-Division (RND)-type efflux pumps in bacteria has great clinical significance. RND efflux pumps are tripartite systems, driven by proton motive force. The pumps usually consist of a transporter protein that interacts with a membrane fusion protein (periplasmic) as well as with an outer membrane protein channel to permit the export of drug molecules across membranes. AdeABC in *Acinetobacter baumannii* is a RND pump. The AdeABC efflux pump is regulated by AdeRS, a two-component system (TCS) consisting of a sensor kinase (AdeS) and a response regulator (AdeR). In this study, homology modelling was used to investigate the role of the novel mutations within AdeRS in carbapenem resistance. Since, the role of AdeRS in carbapenem resistance among *A. baumannii* is still limited; thus, it is important to know the association of novel mutations in AdeRS with overexpression of AdeABC efflux pump and carbapenem resistance.

Overexpression of AdeABC was detected by q-RT-PCR among 29% of carbapenem-resistant *Acinetobacter baumannii* and several mutations within AdeS (GLY186VAL, SER188PHE, GLU121LYS, VAL255ILE) and AdeR (VAL120ILE, ALA136VAL) were detected by sequencing. The sequence and structure-based study of AdeRS was performed to analyze the probable effect of these mutations on regulation of TCS, especially, utilizing its three-dimensional structure. AdeS mutations inhibited the transfer of a phosphate group to AdeR, preventing the binding of AdeR to the intercistronic-region, leading to overexpression of AdeABC. The elucidation of the role of mutations in AdeRS improves our understanding of TCS-based regulation in *Acinetobacter baumannii*.

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

- Antimicrobial Resistance Course (AMR) – One health challenge –Nov 1st to 5th 2021 at Les Pensières Center for Global Health at Veyrier-du-Lac, France ("Conference Center") organized by Mérieux Foundation and the Université de Paris
- 32nd European Congress of Clinical Microbiology and Infectious Diseases, Lisbon, Portugal, 23rd- 26th April, 2022. Carriage of antibiotic-resistant bacteria in maternal and neonatal gut: the mcr story (Presented by S.Basu online)

Awards/ Honours received

- Member of the WHO Technical Advisory Group on Vaccines and Antimicrobial Resistance.
- Elected as Fellow of the West Bengal Academy of Science & Technology.

Post and Pre-Doctoral Fellows:

Post-Doctoral Fellow:
Dr. Subhasree Roy, CSIR Scientist Pool

Pre-Doctoral Fellow:
Ms. Shravani Mitra, SRF-Agartala ICU
Ms. Sharmi Naha, SRF-ICMR
Ms. Amrita Bhattacharya, SRF-ICMR
Ms. Priyanka Basak, JRF-ICMR
Mr. Ankur Rao- JRF
Ms. Tanusree Das- JRF

H. Koley (Principal Investigator), Bacteriology Division

Development of outer membrane vesicles-based vaccine against diarrhoeagenic *Escherichia coli*

Escherichia coli strains have developed the ability to cause disease of the gastrointestinal, urinary, or central nervous system in even the most robust human hosts. *E. coli* strains are among the most important bacterial causes of childhood diarrhoea. Diarrhoeagenic *E. coli* (DEC) strains can be divided into six main categories on the basis of distinct epidemiological and clinical features, and specific virulence determinants. These subtypes are enteropathogenic *E. coli* (EPEC), enterotoxigenic *E. coli* (ETEC), enteroinvasive *E. coli* (EIEC), enterohemorrhagic *E. coli* (EHEC) or Shiga-toxin producing *E. coli* (STEC), enteroaggregative *E. coli* (EAEC), and diffusely adherent *E. coli* (DAEC). In this study we have developed a pentavalent OMV-based immunogen formulation from five prevalent DEC strains (ETEC, EPEC, EHEC, EAEC, EIEC). We will use this formulation as next generation candidate vaccine in mice model, against these deadly pathogens.

Transmission electron microscopic (TEM) analysis of OMVs revealed the morphology of different DEC strains. The lipid bilayer vesicles can be clearly distinguished from TEM analysis (Fig. 18). DLS analysis of OMVs revealed that different clinical isolates of DEC characteristically secrete different sizes of OMVs. The average diameter of EHEC OMVs was found to be 51.39nm, of EAEC OMVs was 45.3nm, of EPEC OMVs was 101.1nm, of EIEC OMVs was 36.73nm and of ETEC OMVs was 50.77nm (Fig. 19). Administration of 10µg dose of OMVs per 100µl of PBS generated a significant amount of immune response which is evident from western blot analysis and ELISA (Fig. 20).

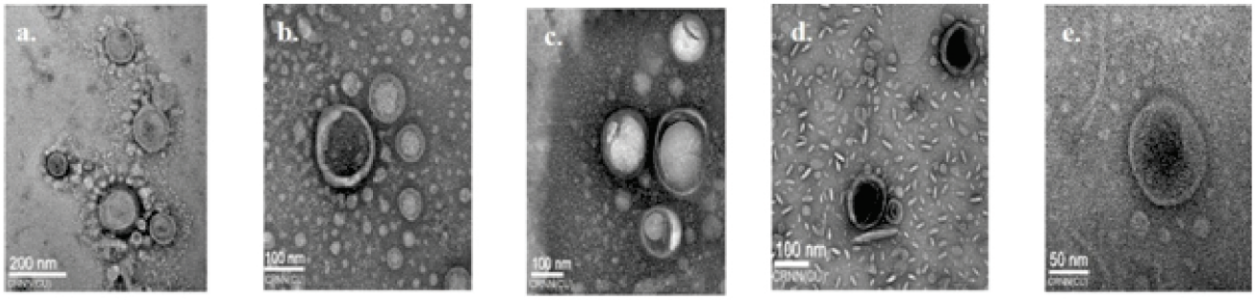


Fig 18 : Representative transmission electron microscopic (TEM) analysis of OMVs; (a) EHEC OMV; (b) EAEC OMV; (c) EPECOMV ;(d) EIEC OMV; (e) ETEC OMV;

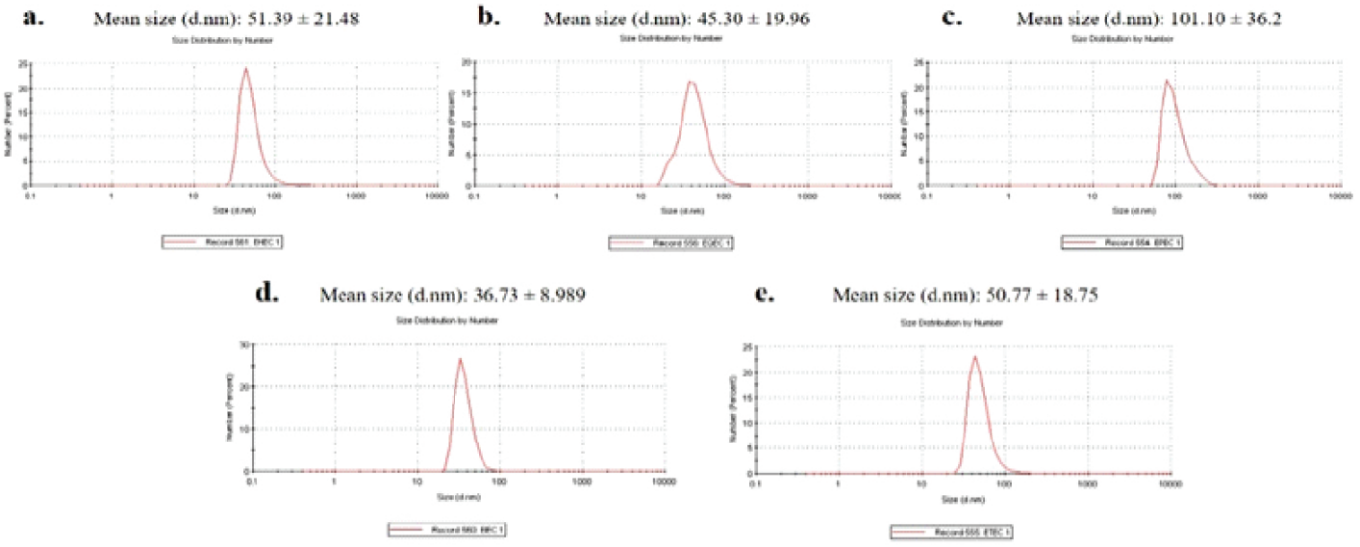


Fig 19 : Dynamic light scattering (DLS) analysis of OMVs; (a) EHEC OMVs; (b) EAECOMV; (c) EPEC OMVs; (d) EIEC OMVs; (e) ETEC OMVs

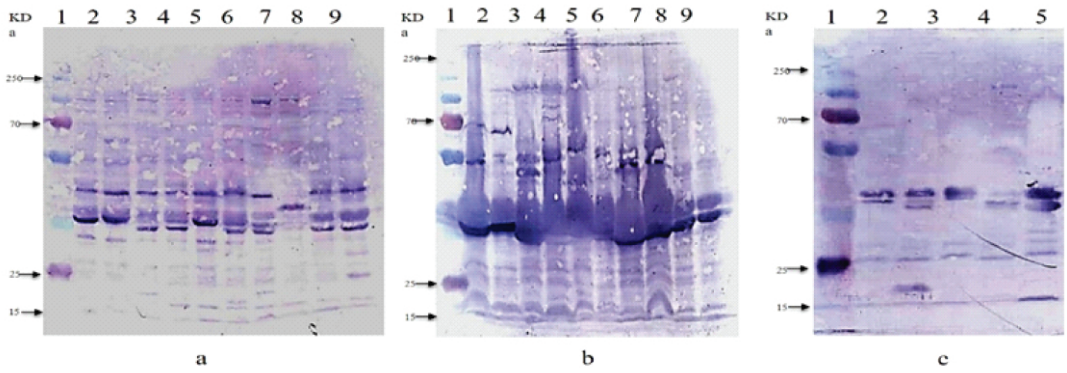


Fig 20 : (a) Western blot of whole cell lysates (WCLs); 1- Marker, 2- EPEC BCH 8865, 3- EPEC BCH 9327, 4- ETEC BCH 8031, 5- ETEC H10407, 6- EAEC DSM 411, 7- EAEC BCH 04060, 8- EIEC IDH 10106, 9- EIEC BCH 10709, 10- EHEC PD124, 11- EHEC VT3; (b) Western blot of outer membrane proteins (OMPs); 1- Marker, 2- EPEC BCH 8865, 3- EPEC BCH 9327, 4- ETEC BCH 8031, 5- ETEC H10407, 6- EAEC DSM 411, 7- EAEC BCH 04060, 8- EIEC IDH 10106, 9- EIEC BCH 10709, 10- EHEC PD124, 11- EHEC VT3;(c) Western blot of outer membrane vesicles (OMVs) isolated from immunization strains; 1- Marker, 2- EPEC BCH 8865, 3- ETEC BCH 8031, 4- EAEC DSM 411, 5- EIEC IDH 10106, 6- EHEC PD124;

Patent(s) filed/accepted/Technology developed

Title : A bivalent typhoidal bacterial ghost (BTBG) immunogenic formulation and method for preparation thereof

Patent application number : 202211034380

Post and Pre-Doctoral Fellows:

Pre-Doctoral Fellow:
Mr. Prolay Halder, SRF-ICMR
Mr. Soumalya Banerjee, SRF-UGC
Mr. Sanjib Das, SRF-UGC

M. Bardhan, Bacteriology Division

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

- Proteomics Advanced Winter School (PAWS)-2021 faculty training workshop, IIT Bombay and Department of Science and Technology.
- Sensitization Workshop on Pharmacovigilance, ICMR-National Institute of Cholera and Enteric Diseases (NICED).
- Mixed Method Research Workshop, All India Institute of Hygiene and Public Health, Govt of India.
- Application of Biostatistics in Clinical Research, National Institute of Mental Health And Neurosciences (NIMHANS), Bengaluru, India.
- ICMR-Health Research Fundamentals, Indian Council of Medical Research-National Institute of Epidemiology.
- Spread Sheet Data Management : Simple Convenient and Yet Powerful, ICMR-National Institute of Occupational Health, Ahmedabad.
- Next-Generation Sequencing : Fundamentals, DNA Variant Calling and RNA-Seq Expression Analysis, Department of Science and Technology and Ashoka University.

Jutang Babat Ain Tiewsoh, Bacteriology Division

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

Title of Workshops / Meetings / Trainings	Dates	Place	Organizer	Status of participation
NIE – ICMR e – Certificate course: NIeCer102 on 'Ethics Review of Health Research'	2021 to January 2022 October	Online	ICMR – National Institute of Epidemiology and NPTEL	Attended & completed certificate course
Workshop: '3rd training workshop on Biosafety and Biosecurity'	26/10/21	ICMR – NICED, Kolkata	Regional Virus Research and Diagnostic Laboratory, ICMR – NICED, Kolkata	Attended
ICMR – NIE Online course NIeCer 103: 'Scientific Writing in Health Research'	December 2021 to March 2022	Online	ICMR – National Institute of Epidemiology and NPTEL	Attended & completed certificate course
National Training Program on 'Capacity Building Program for Technical Personnel'	06/12/21 to 17/12/21	Online	AMITY group of universities sponsored by Department of Science and Technology, Government of India	Attended
Workshop on 'Advance Statistical Data Analysis using SPSS'	21/01/22 to 27/01/22	Online	Science Tech Institute, Lucknow	Attended

S. Bhattacharya (Principal Investigator), Biochemistry Division

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

Antibiotic treatment plays an essential role in preventing *Shigella flexneri* infection. However, incidences of global rise in antibiotic resistance create a major challenge to treat bacterial infection. In this context, there is an urgent need for newer approaches to reduce the *S flexneri* burden. This study largely focuses on the role of the herbal compound capsaicin (Caps) in inhibiting *S flexneri* growth and evaluating the molecular mechanism behind bacterial clearance. Here, we showed for the first time that Capsaicin inhibits intracellular *S flexneri* growth by inducing autophagy. Capsaicin-induced autophagy is one of the key factors responsible for bacterial clearance. Capsaicin induced autophagy resulted in autophagosome formation which kills intracellular *Shigella flexneri*.

Fig 21 : As autophagosome formation is associated with membrane-bound LC3B, therefore GFP-LC3B-transfected cells were exposed to Capsaicin and examined under a confocal microscope. Capsaicin treatment resulted in an increased recruitment of LC3B to bacteria
Fig 22 : Moreover, the efficacy of Capsaicin in reducing *S flexneri* growth was confirmed in an animal model. After infection, mice were treated with Capsaicin and then sacrificed for further studies. We took the colon from infected and Caps-treated mice samples. The bacterial count showed a decrease in *S flexneri*-infected mice that received Capsaicin
Fig 23 : This study showed for the first time that *S flexneri* infection can be inhibited by inducing autophagy. Overall, these observations suggest that Capsaicin activates autophagy and thereby inhibits *S flexneri* infection.

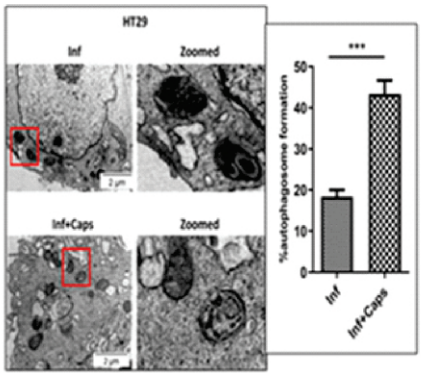


Fig.21 Transmission electron microscopy (TEM) images showed Capsaicin (Caps) induces autophagosome formation to kill intracellular *Shigella flexneri* in intestinal cells

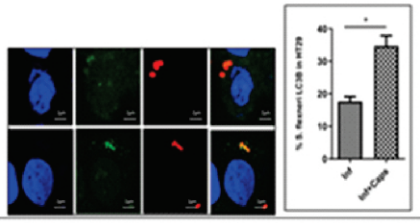


Fig22 Microscopic images of GFP-LC3B-transfected intestinal cells (HT-29) revealed recruitment of *Shigella flexneri* (red) to LC3B (green).

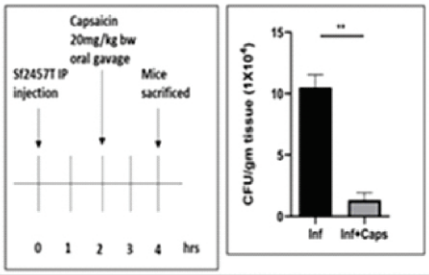


Fig.23 Capsaicin (Caps) treatment in mice model of *Shigella flexneri* showed inhibition of bacterial growth

Capsaicin
↓
Autophagy
↓
Inhibits intracellular *Shigella flexneri* growth

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.

The complete genome sequences of all the four serotypes of Dengue Virus were retrieved from public domain and clustering of four sequence sets were performed separately for each of the four serotypes. For each of the four serotypes we have carried out Maximum likelihood phylogenetic analysis and it was observed that for all the serotypes Asian sequences are forming completely separate clusters from the American sequences. We calculated the evolutionary rate for each of the four serotypes, considering the Asian and American sequences separately. For each of the four serotypes, the American sequences found to be under stronger selection pressure than the Asian sequences. We also observed that the region where the selection pressure was maximum involved in host receptor binding. Molecular interaction analysis of the envelope proteins with the host receptor DC-SIGN revealed contrasting degrees of binding affinities among the four different serotypes depending on the geographical location of isolation.
We retrieved the protein-protein interaction network data for the "only human" and "dengue-human" from freely available databases. We calculated the global network centrality parameters for all the human proteins present in dengue-human protein-protein interaction network for a given serotype and calculated same parameter in the only human protein-protein interaction network. By comparing two sets of global network centrality parameters we retrieved those proteins having higher values in dengue-human protein-protein interaction network but lower values in 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.

Multi-omics approach towards drug repositioning for Dengue virus infection.
Dengue is a vector-borne disease that is a major public health threat globally. It is caused by the dengue virus, which is one of the most important arboviruses in tropical and subtropical regions. Dengue virus is a positive-stranded encapsulated RNA virus and is composed of three structural protein genes, which encode the nucleocapsid or core (C) protein, a membrane-associated (M) protein, an enveloped (E) glycoprotein and seven non-structural (NS) proteins. The World Health Organization has classified dengue infection as a neglected tropical disease. Despite the urgent need, so far, no effective antiviral agents have been identified for treating dengue infection and existing treatments are only supportive. Traditional drug discovery takes enormous amounts of time, money, and effort to find a new drug. In this approach, the target drugs have already been tested for their effectiveness against other diseases or conditions and have been proven safe for human use; hence, the success rate in this technique is expected to be high. Here, we applied a computational drug repositioning method by performing omics analyses of publicly available expression profile and protein interaction data. Our drug repositioning method is based on rational integration of multiple omics data. The identified drug candidates are expected to induce a suppressed level of gene expression and disrupt the association of host proteins with dengue virus proteins.

Natural selection shaped the evolution of amino acid usage in mammalian toll like receptor genes
Toll-like receptors (TLRs) are important as they are able to sense diverse set of pathogens associated molecular patterns (PAMPs) as ligands. These receptors are involved in functions such as immune response, development of signalling process and cell adhesion. In the present study we are interested to analyse the influence of evolutionary selection pressure on the mutational diversity of mammalian TLR genes. We observed differential patterns of amino acid usage between primate and non-primate mammalian TLR genes. GC-content of TLR genes and hydrophobicity of the encoded proteins are the most influential factors correlated with the differential pattern of amino acid usage. The influence of the subcellular location on the amino acid usage pattern of TLRs is evident in present study. Purifying selection is uniformly present on TLR genes, positively selected sites are mostly located over the ligand binding domain. Our study clearly demonstrates that natural selection has shaped the evolution of primate and non-primate mammalian TLR genes.

Computational molecular modelling and interaction study between ACE2 receptor from diverse Indian human genome with the spike protein variants of SARS-CoV-2
Study of the interactions established between the viral glycoproteins and their host receptors is of critical importance for a better understanding of virus entry into cells. The novel coronavirus SARS-CoV-2 entry into host cells is mediated by its spike glycoprotein (S-glycoprotein), and the angiotensin-converting enzyme 2 (ACE2) has been identified as a cellular receptor. Binding of the SARS-CoV-2 spike protein to the ACE2 promotes cellular entry. Therefore, human ACE2 variations could also influence susceptibility or resistance to the virus. It is very likely that there exist ACE2 variants in human populations that may increase or decrease its affinity to SARS-CoV-2 spike protein and thereby render individuals more resistant or susceptible to the virus. A deeper understanding of the genetic variations in ACE2 might contribute to the development of effective treatment and preventive measures. ACE2 variants can affect the

binding stability, influencing the interaction between spike protein and ACE2 through imposing conformational changes and therefore may cause a decrease or an increase in the ligand-receptor affinity.
India is a land of vast human diversity which is represented by the genetic diversity of various well-defined population groups. It is also known that human genome sequence varies depending on various population groups. Therefore, ascertaining genetic variability of ACE2 across various human populations will be an important task. Our focus is to study the interaction of Indian variants of human ACE2 receptor with SARS-COV-2 to evaluate the susceptibility of Indian populations towards SARS-CoV-2 infection.

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

- Attended a workshop on "AMR events in Asia" during 18/10/2021 to 20/10/2021 organized by European Union at Bangkok.

Post and Pre-Doctoral Fellows:

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

M. Dutta (Principal Investigator), Electron Microscopy

Cryo-electron tomographic study of Shigella infection cycle by a newly isolated lytic myoviridae phage: a developmental approach towards optimizing phage therapy

Myoviridae phages possess a highly sophisticated long contractile tail with a complex baseplate structure, tail fibers, and a sharp tip-like domain. Bacteriophages utilize their tail fibers and baseplate components to transfer their genome through the tail tip into the host cytoplasm which is similar to the working principle of a micro syringe. But initial attachment to the host cell, conformational changes in tail components, membrane puncturing, and genome delivery process remain poorly understood areas of phage biology. High-resolution cryo-electron microscopy (cryo-EM) has emerged as a fundamental structural technique to study proteins, viruses, and dynamic cellular processes in unprecedented detail. The main hypothesis of this project is an extensive structural change in the phage tail components during an infection process that will unfold the mechanism of long-tailed phage-host bacteria interaction. In this study, a well-characterized long-tailed Shigella phage Sfk20 was selected to study the structural rearrangement during its infection process. Initially, the long-tailed and contracted-tailed phages (Fig. 24).

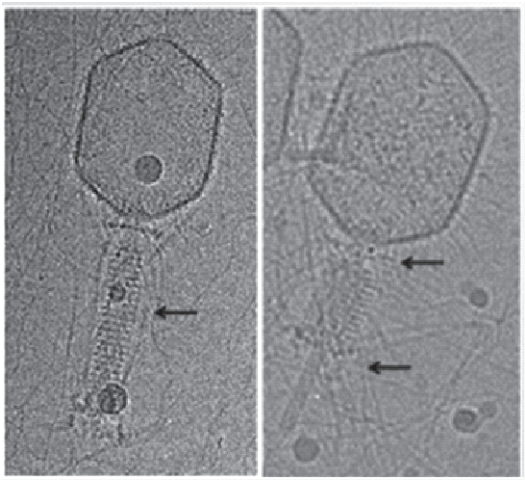


Fig 24 : Long-tailed Sfk20 phage (Left), Contracted-tailed Sfk20 phage (Right)

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

Title : 2nd Annual Symposium on Single-particle CryoEM and Cellular Tomography.
Date : 18th December, 2021.
Place : Online
Organizer : CEM3DIP Society of India in association with School of Biology IISER Thiruvananthapuram
Status of participation : Invited Speaker
No. of attendees : approximately 30
Presentation Title : "Seeing is believing: Multifaceted Application of Cryo-EM and Cryo-ET in Structural Virology.

Title : "Vigilance Awareness Week".
Dates : 26th Oct – 1st Nov 2021
Place : NICED-II, Seminar Room
Organized by : Dr. Moumita Dutta as Vigilance Officer (ICMR-NICED)
No. Participants : 100 (approximately)

Pre-Doctoral Fellow:
Ms Bani Mallick, SRF-UGC
Ms Payel Mondal, SRF-CSIR
Mr. Aninda Dutta, JRF-DST-SERB POWER

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

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

- Acted as trainer for Online Training of State Programme Officials on Climate Sensitive Health issues under NPCCHH Programme during August 10-13, 2021.
- Participated as a member of the Technical Resource Group in a meeting to discuss a WHO-India funded project on "Development of a technical framework for establishing comprehensive surveillance system for HIV/AIDS-related mortality in India" on September 03, 2021 at ICMR-NICED.
- Participated in a Qualitative Data Analysis workshop (virtual) on October 29, 2021.
- Participated in a three-day workshop on in-depth analysis of data and crystallization of findings of phase-1 for the study on Epidemiological Investigation into the drivers of HIV/AIDS epidemic in select north-eastern states held at ICMR-NICED, Kolkata, during December 21-23, 2021.
- Attended a virtual meeting on Vulnerability Needs Assessment in the context of Climate Change and Human Health as a member of the Technical Expert Group of NCDC held on January 03, 2022.
- Attended the review meeting (virtual) of the Centres of Excellence under NPCCHH held on March 11, 2022 conducted by NCDC.

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

An Event-Driven, Phase 3, 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

Co-Principal Investigator : Dr. Shanta Dutta, Director and Scientist G, Dr. Agniva Majumdar, Scientist C

ICMR-NICED is one of the sites for the efficacy trial of the indigenous COVID Vaccine (COVAXIN) A total of 1005 subjects were consented between 1st Dec 2020 and 7th Jan 2021. A total of 987 participants were eligible and dosed following randomization, nasopharyngeal swab and blood collection.

The planned primary efficacy endpoint analyses based on the accrual of 130 virologically-confirmed (RT-PCR positive) symptomatic cases of COVID-19 post Dose 2 (+14 days) resulted in an overall vaccine efficacy of 77.8% and Vaccine efficacy of 93.4% against the severe COVID-19 cases.

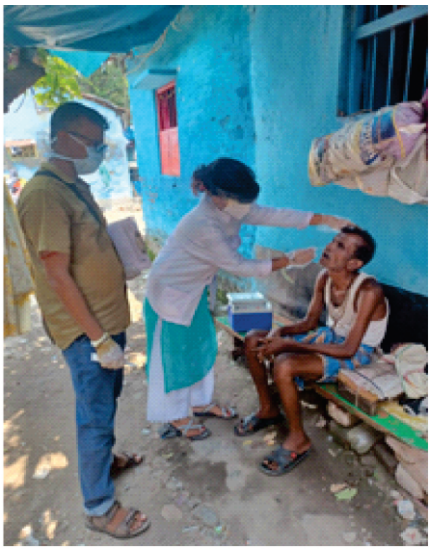
Following unblinding, ICMR-NICED initiated dosing to the placebo participants. We have dosed 440 placebo participants following consenting. All the participants have received their vaccination certificate through COWIN. Four Serious Adverse Events were reported including one death and none was related with the Investigational Product. At present there is no active participant in the study.

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

Principal Investigator : Dr. Suman Kanungo, Scientist E

Co-Investigator : Dr. Alok Kumar Chakrabarti, Scientist E

This is the first community based multi-site study in India to define the epidemiology and risk factors of influenza and other respiratory viruses associated ARI among elderly population. 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 from East, West, South, North zone 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. The hospital based surveillance system of severe acute respiratory infection (SARI) among older adults aged 60 years in 2-Tertiary hospitals (1-private & 1 – Govt.) and 2 –Secondary hospitals (1-private & 1 – Govt.) were initiated from January 2019.



Specimen collection
from ARI cases by nurse

During surveillance period from July 2018 to 11th March, 2022, a total of 4,082 AURI and 244 ALRI were detected from the community cohort. A total of 563 COVID like illness (CLI) cases were also identified during surveillance period 28th June'21 to 11th March'22 from the community cohort. The positivity rate of Influenza was 5.8% (93/1595) in the community and 15.9% (46/288) in the hospital among enrolled SARI patients. Influenza A positivity rate was higher (15.3%) among hospitalized SARI patients than 4.1% in the community. Comparatively, Influenza B was lower i.e 1.8% in the community and 0.7% in the hospital among SARI patients. RSV (Respiratory Syncitial Virus) positive cases was detected very less (only 7 cases in the community and 6 cases in the hospital). CLI positivity rate was 12.4% (70/563) in the community cohort (Table 5).

Table 5 : Laboratory results from community and hospital samples

	Community (July'18 – March'22)	**Hospital** (Dec'18 – March'20)
Total Specimens collected	1632	288
Tested for Influenza	1595	288
Inf A	65 (4.1%)	44 (15.3%)
Inf A/PDMA (H1N1)	32	15
Inf A/H3N2	33	29
Inf B	28 (1.8%)	2 (0.7%)
Inf B /Yamagata	13	0
Inf B /Victo	15	2
RSV Positive	7	6
CLI specimen tested for SARS-COV2	563	NA
COVID Positive	70 (12.4%)	NA

The study is continuing.

A Prospective, Multicenter, Randomized, Active-controlled, Observer-blind, Phase II study seamlessly followed by a Phase III study to evaluate the Safety, Tolerability and Immunogenicity of the candidate GEMCOVAC19 (COVID-19 vaccine) in healthy subjects

Principal Investigator : Dr. Shanta Dutta, Director and Scientist G

Co- Principal Investigator : Dr. Suman Kanungo, Scientist E, Dr. Alok Kr Chakrabarti, Scientist E, Dr. Agniva Majumdar, Scientist C

This is a randomized, observer-blind, active controlled, seamless, Phase II/III study. Phase III part of the study enrolled 4000 healthy subjects pan India. Phase III of the study subject enrolment was in 3:1 randomization scheme to receive either GEMCOVAC19 (10 microgram) or COVISHIELD™. Thus, 4000 randomized subjects in Phase III study with 3000 randomized to GEMCOVAC19 arm and 1000 randomized to COVISHIELD™ arm considered as 'Safety Cohort' of the study. A subset of these subjects constituted the immunogenicity cohort.

ICMR-NICED had enrolled one hundred and thirty-five (125) participants in this study within the period of 6th December to 17th December, 2021. Currently day 119th / follow up visit 5 was completed on 14th April, 2022. During this study period, no serious adverse events were reported till date. Whereas six episodes of suspected COVID-19 symptoms were reported and all of these symptomatic participants were tested for COVID-19 RT-PCR. Eventually all suspected participants were tested as negative (Table 6).

Table 6 : Overall Study Status

Event	**Date/Number**
1st Subject enrolled	06-Dec-2021
Total no. of subject screened	128
Total no. of screen failed subjects	3
Total no. of subject randomized	125
Total no. of subjects dosed	125
Total no. of drop out subjects	4
Total no. of active subjects	121
Total no. of SAE	0

Immune response to precautionary third dose of COVISHIELD/COVAXIN among healthy adult population: an ICMR Cohort study, India"

Principal Investigator : Dr. Suman Kanungo, Scientist E

Co-Investigator : Dr. Shanta Dutta, Director and Scientist G, Dr. Alok Kumar Chakrabarti, Scientist E, Dr. Shubarna Chakraborty, Scientist B

This study is conducted to characterize SARS-CoV-2 specific humoral and cellular immune response after homologous additional third dose of COVISHIELD/ COVAXIN vaccine at different time points and to estimate the incidence of SARS -CoV-2 infection post third dose of COVID-19 vaccine. For evaluating the immunogenicity, blood is collected at the following time points-baseline (before the third vaccine dose), four weeks, three months, six months and one year after the third dose.Individuals who develop symptoms suggestive of COVID-19 any time after receiving third dose will be tested for COVID-19 using RT-PCR. Information on COVID-19 testing and their results will be collected during the follow up visits. ICMR-NICED started enrolling participants since 16th Feb 2022. All the participants were consented before enrollment. As on 09th June,2022, ICMR-NICED have enrolled total of seventy-five (75) participants and sixty-two (62) of them received Covaxin and other thirteen (13) participants have received Covishield. At present the study is ongoing (Table 7).

Table 7: (Status as on 09th June, 2022)

Date of IEC Approval	09th Feb 2022
Date of first participant enrollment	16th Feb 2022
Total no. of participant Consented, bled and been administered the third dose	75
Total no. of participant administered COVAXIN administered	62
Total no. of participant administered Covishield	13
Bleeding at baseline (No. of participants)	75
Bleeding at four weeks after third dose (No. of participants)	42
Bleeding at three months after third dose (No. of participants)	19
Bleeding at six months after third dose (No. of participants)	Nil
Bleeding at one year after third dose (No. of participants)	Nil

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

Principal Investigator : Dr. Shanta Dutta, Director and Scientist G

Co- Principal Investigator : Dr. Suman Kanungo, Scientist E, Dr. Alok Kr Deb, Scientist F, Dr. Debjit Chakraborty, Scientist D, Dr. Agniva Majumdar, Scientist C

This trial intends to investigate whether adopting a battery of available diagnostic tests and clinical diagnostic algorithms, coupled with training and communication activities and clinic process flow changes by both healthcare providers and patients (or rather their parents/guardians in this study population) can result in improved care of acute febrile illness and more rational antibiotic prescribing for children and adolescents presenting to outpatient clinics in low- and middle-income countries (LMICs). Just-in-case' antibiotic prescribing practices is one of the main causes of antimicrobial resistance (AMR) and inadequate management of acute febrile illnesses, both resulting in increased morbidity and mortality. At the same time, many who would require antibiotic treatment do not get it. An adaptation in practice needs to occur to improve patient's management. Success will mean making significant steps toward achieving the dual goal of tackling AMR and providing universal health coverage (UHC).

Field activities

ICMR-NICED had health clinic set up along with field laboratory at the KMC ward 58 and 59. From these two wards children enrolled to participate in the study were from the age 6 months to <14years and adolescents 14 years to less than 18 years old of both sexes. Field activitiesThe total enrollment from October 2021 till May 2022 total of 1,110 (Arm A (control Arm) 552 of participants and Arm B (Intervention Arm) = 558 participants

Target for enrollment 1760 participants from the KMC Ward 58 and 59 (Project Start date: March 2021, Enrollment of participants start date: October 2021)

Table 8 : Overall Study Status:

	Ward 58	Ward 59	Total
Number screened	568	547	1115
Number enrolled	564	546	1110
Number excluded Not meeting the eligibility criteria	04	01	05

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

- Attended 8th Meeting of the Global Task Force for Cholera Control (GTFCC) - Working Group on Oral Cholera Vaccine from 6.12.2021 to 8.12.2021
- Attended ICMR-Elsevier Webinar Series 6th Webinar on "Vaccinology" as on 20.12.2021
- Attended 7th Meeting of the Global Task Force for Cholera Control (GTFCC) – WASH Working Group from 9.3.2022 to 10.3.2022
- Attended 3 meeting of Project Review Committee of ICMR in 'Diarrhoeal Diseases'

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

Principal Investigator : Dr. Debjit Chakraborty, ICMR-NICED

Co-Principal Investigator : Dr. Alok Kumar Deb, ICMR-NICED, Dr. Falguni Debnath, ICMR-NICED, Dr. Agniva Majumdar, ICMR- NICED, Dr. Kalpana Datta, Program Director, PCOE, MCH, Kolkata (Site-PI), Ms. Swastika Sinha Roy, Nutritionist, PCOE, MCH, Kolkata, Dr. Prasenjit Saha, SMO, PCOE, MCH, Kolkata

This facility based cross sectional study is planned to estimate prevalence of malnutrition, immunization coverage, chemoprohylaxis adherence and factors associated based on assessment of 300 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. Major finding so far based on analysis of 100 children were malnutrition (48%), Vitamin D3 deficiency (71%) and dietary calorie deficit (77%). Malnutrition (Z score below -2SD in any indicator) was more among boys than girls (58% vs 31%). Stunting was the most common form of malnutrition observed (36%). Vitamin D3 deficiency is more common among girls than boys (80% vs 66%) Thus this study will generate evidence on nutritional deficiency and adherence gap if any in reference to national dietary guidelines for HIV infected children for further policy direction.

Validation study of Urinary Tract Infection Rapid diagnostic kit with antibiotic sensitivity (Rapidogram) at health facilities of West Bengal

Principal Investigator : Dr. Debjit Chakraborty, Scientist D, ICMR- NICED

Co-Principal Investigator : Dr. Shanta Dutta, Director and Scientist G, ICMR- NICED, Dr. Agniva Majumdar, Scientist C, ICMR- NICED, Dr. Falguni Debnath, Scientist D, ICMR- NICED, Dr. Atreyi Chakrabarti, Deputy CMOH 2, S24 Parganas, Govt of WB

Urinary Tract infection (UTI) is one of the most commonly diagnosed infections in both hospitalized and community-dwelling older adults. UTIs in the community setting are further treated empirically in absence of proper culture & sensitivity performing facility. Hence to ensure evidence-based prescription of antibiotics particularly in peripheral health care facilities, a relatively rapid testing (Rapidogram) as developed by Sree Chitra Tirunal Institute for Medical Science & Technology is validated at health facilities under present study. This cross-sectional study is conducted over 8 months in suspected UTI cases recruited from Baruipur SDH and Sonarpur BPHC of South 24 Parganas districts through consecutive sampling. For diagnostic validation, Rapidogram test is done using part of urine sample at ICMR-NICED and result is communicated to the treating physician. Remaining urine sample will be processed for culture and sensitivity. Validation against gold standard will be measured in terms of sensitivity, specificity, PPV, NPV, LR, DOR, Accuracy and Agreement. Preliminary findings based on analysis of 205 urine samples reflects a sensitivity of 90.5% (95% CI: 69.6% - 98.8%), Specicity of 100%, PPV 100% and NPV of 98.9% (95% CI: 96.2 % - 99.8%). Major antibiotics prescribed were Ciprofloxacin, Norfloxacin, Amoxycillin clavulanic Acid, Nitrofurantoin etc. Major organism isolated included E. coli, Klebsiella, Enterococcus etc. Resistance to Ampicillin, Ceftriaxone, Cefixime, Ciprofloxacin, Nalidixic acid, Norfloxacin was observed. The study will generate evidence on validation of Rapidogram UTI Kit at peripheral health facility. The finding of the study will be helpful to make policy decision in rolling out said kit at peripheral levels to implement appropriate evidence-based management of UTI.

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

- Attended Eastern Regional Communications Hub Meeting (virtually) conducted by ICMR Communication Unit on 21.05.2021

- Attended Eastern Regional Communications Hub Meeting (virtually) conducted by ICMR Communication Unit on 08.06.2021
- Attended Regional Communications Hub Meeting and Social Media training (virtually) conducted by ICMR Communication Unit on 20.07.2021
- Attended Annual NCO Meet and Workshop (virtually) conducted by ICMR Communication Unit from 16.09.2021 – 17.09.2021.
- Attended 2nd National LGBTQI Symposium in New Delhi (Physically), organized by Humsafar Trust and NACO from 09.12.2021 to 11.12.2021. Participated as a Panelist in the Panel Discussion.
- Attended Full Regional Communications Hub meeting and Workshop (virtually) conducted by ICMR Communication Unit on 14.12.2021
- Attended Antimicrobial resistance (AMR) online Workshop organized by European Union on 16.12.2021
- Completed E-Course on Systematic Review and Meta-Analysis conducted by Indian Institute of Public Health (Gandhinagar) from 01.09.2021 to 31.12.2021

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)

Principal Investigators : Dr. Debjit Chakraborty, Scientist D and Dr. Falguni Debnath, Scientist D, Division of Epidemiology, ICMR- NICED

Co-Investigators : From ICMR-NICED **:** Dr. Shanta Dutta, Director & Scientist G, Dr. Alok Kumar Deb, Scientist F, Division of Epidemiology, Dr. Asish Mukherjee, Scientist F, Division of Bacteriology, Dr. Sulagna Basu, Scientist F, Division of Bacteriology, Dr. Agniva Majumder, Scientist C, Division of Bacteriology From State Health Department (IDSP) **:** Dr. Dipankar Maji, DDHSPH & SSO IDSP, Mr. Palash Mandal, State Microbiologist, IDSP

The major objectives of this study are to study antimicrobial resistance pattern, prescription practices and community antibiotic consumption behavior through a multitier approach towards development of framework for Antimicrobial Resistance Surveillance Program and to assess preparedness of public health systems for implementing Antimicrobial Stewardship Program through a multidisciplinary consensus network approach. Currently the study has been conducted in three hospitals of South 24 Parganas district namely Diamond harbour medical college and hospital, Baruipur SD hospital and Sonarpur BPHC. We are collecting specimens and prescriptions of diarrhoea, acute respiratory tract infection, Urinary tract infection, septicaemia from both IPD and OPD. Sofar, 295 samples have been collected, of which 275 are of UTI. In 14% of the UTI samples culture are positive for any organism. Major organism isolated are *E. coli*, *Klebsiella*, Enterococcus resistant to Ampicillin, Ceftriaxone, Cefixime, Ciprofloxacin, Nalidixic acid, Norfloxacin. Major antibiotics prescribed for UTI treatment are Ciprofloxacin, Norfloxacin, Amoxycillin clavulanic Acid, Nitrofurantoin etc. In 49% of UTI cases at least one antibiotic has been prescribed before culture confirmation. Among the collected 18 rectal swab specimens from diarrhoea patients, four showed growth for S.Flexneri and were resistant to drugs of fluroquinolone group.

Apart from S 24 PGS district, the project will now start in Malda and Bankura district. Initially we started the project as an intramural project, however, this has been selected for ICMR extramural grant and soon will be rolled out in the mentioned district with that support.

Initial project meeting at
Diamond Harbour Medical college and Hospital,
2nd February 2022.

Data collection at
Baruipur SD Hospital, South 24 Parganas,
2022.

Study of prescription practices on Common infections along with Prescriber's perspective through multitier approach in West Bengal

Principal Investigator : Dr. Falguni Debnath, Scientist D, Epidemiology, ICMR- NICED; Dr. Debjit Chakraborty, Scientist D, Epidemiology, ICMR-NICED

Co-Investigators : Dr. Shanta Dutta, Director and Scientist G, Bacteriology, ICMR- NICED, Dr. Agniva Majumdar, Scientist C, Bacteriology, ICMR- NICED, Dr. Sandip Mukhopadhyay, Scientist E, ICMR-NICED

Based on our experience in a prior project on prescription evaluation for common infections in tertiary centers, we conceived this project to assess the variability in prescribing pattern in common infections in secondary and Primary tier of hospitals. The project was initially reviewed by institutional Research Review Committee and then we submitted to the SAC. It was presented in SAC 21 and we have received its approval. However, now we have submitted it to IEC of ICMR-NICED. State approval has been obtained to carry out the work at South 24 Parganas District.

M. Bhaumik (Principal Investigator), Immunology Division

Gut microbial butyrate disrupts lipid rafts and prevents enteric pathogen infection

The community of bacteria that lines the intestinal tract is an epitome of symbiotic relation with the host. Earlier we have shown that butyrate but not aceatate or propionate regulates cholesterol homeostasis of the host. We deciphered a probable axis "AUF-1-Dicer1-miR122-cholesterol" by which butyrate downregulates cholesterol synthesis. Cholesterol is an important component of the cell membrane, modulating a plethora of biophysical properties of the membrane. Cholesterol in the membranes whose trajectories' are pre-set membrane dynamics seamlessly culminate to formation of a cholesterol rich station in the membrane called lipid rafts. These lipid rafts are stoked to serve as a gateway for the entry of numerous pathogens. Pathogens can elude the immune system in an innovative way by using membrane microdomains. We studied the cholesterol content and the changes in the physical properties of cell membrane upon butyrate treatment. As a measure of lipid raft formation we performed CTX-B binding assay and atomic force microscopy. Employing gentamycin protection assay we have shown that butyrate prevents invasion of Shigella, Salmonella and ETEC in macrophages. Further leverage on reduced pathogen invasion on butyrate treatment was due to lack of membrane cholesterol was stemmed from restoration of cholesterol in membranes by liposomal delivery which showed reversal of butyrate effect (Fig 25). Our observation in cell line also resonates in mice model. By harmonising narratives from our experimental studies, we showed that gut microbial butyrate decreases membrane cholesterol and disrupts lipid rafts resulted in decrease in pathogen invasion, a "critical" denominator for colonization resistance. Our study provides additional sui-generies forces of colonization resistance in gut.

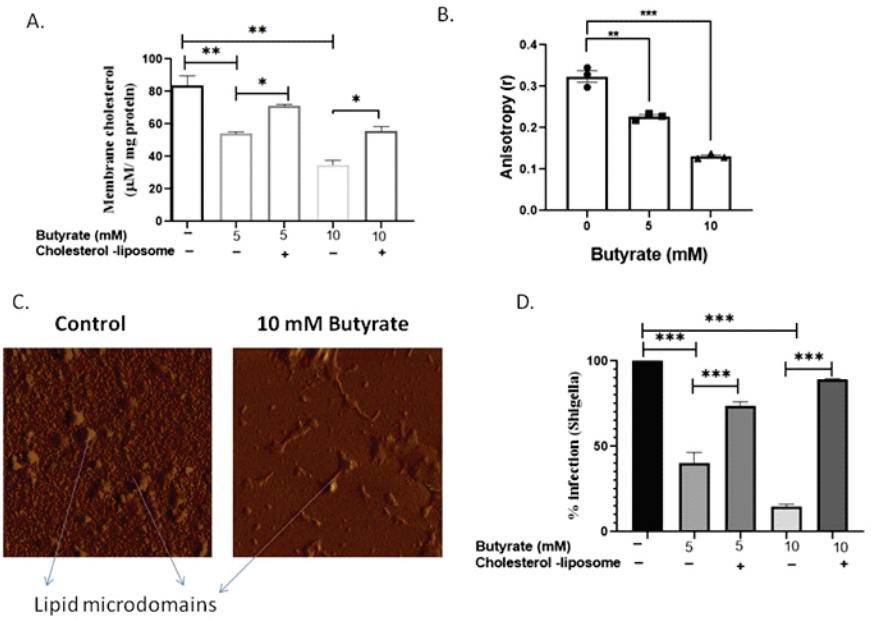


Fig 25: Butyrate treatment on macrophage reduces (A), cellular cholesterol, (B) decreases fluorescence anisotropy, (C) disrupts lipid rafts as studied by AFM and (D) prevents pathogen (Shigella) entry.
Fig 22: RAW264.7 cells were treated with different doses of butyrate (A) membrane cholesterol was estimated and expressed as ug/ mg protein. (B) Fluorescence anisotropy measured by Laudran dye, (C) AFM images showing lipid rich microdomains in control and 10mM butyrate treated cell membranes. (D) Shigella invasion in cell was dertermined by gentamycin protection assay.

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 vaccine in 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. Although there was a significant decrease in IL-10 production in BCG immunization we did not find any significant decrease in viral load in lung, trachea and nasal swab on either therapeutic or prophylactic treatment of BCG (Fig 26).

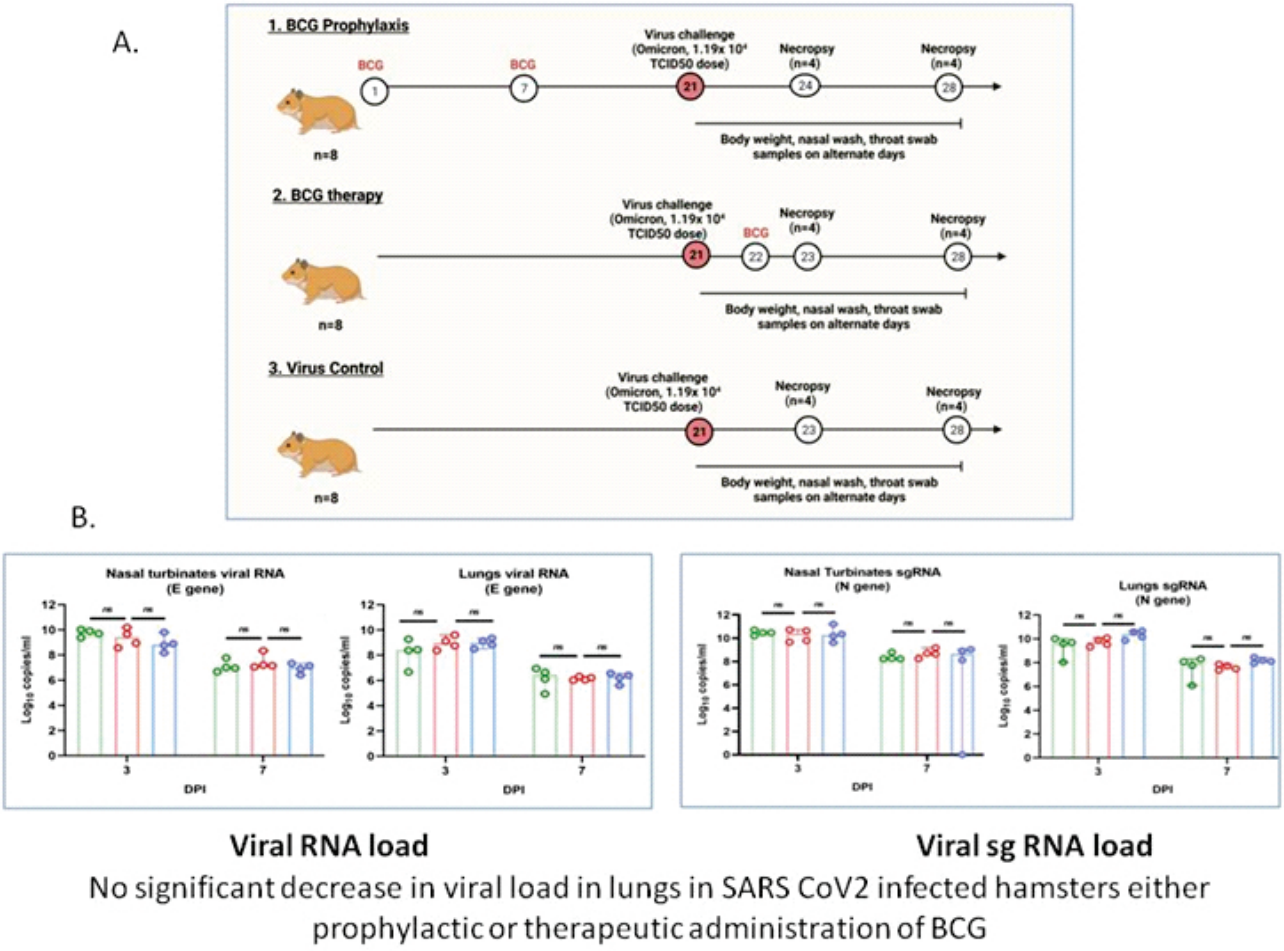


Fig 26: A) Schematic diagram showing immunization with BCG and SARS CoV2 infection in hamsters (B) Viral RNA load and viral sg RNA load measured in lungs.

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

- NIAS-DST Online Training Programme for Women Scientists on 'Social Responsibility of Scientists: Pathways and Outcomes' from February 7th to 11th, 2022
- Invited Lecture and session chair in WB DST sponsored Symposium Physicon 2021, Berhampore Girls College, West Bengal on 14-16 March 2022. The title of the talk "Gut microbial butyrate regulates cholesterol homeostasis by exploits miR122 biogenesis: implication in preventing pathogen invasion in gut".
- Organizing Committee Member and invited speaker in "International Webinar on Pharmacy and Pharma Networks 2022" held virtually on April 18-19, 2022. The title of the talk was "Prenatal arsenic exposure alters gut microbial composition and augments gut permeability function in post natal life: study in mice model."

Post and Pre-Doctoral Fellows:

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

S. Ganguly (Principal Investigator), Parasitology Division

Identification and molecular characterization of common eneteric parasites in Kolkata.

Till date, limited studies have been conducted on genetic characterization of *E. moshkovskii* in India. We investigated SNPs associated with coinfection incidence of the parasite, level of genetic diversity and established the genetic structure among the local isolates of *E. moshkovskii* using molecular analysis tool (DnaSPv5 and MEGAX). We observed 10 SNPs in 18S rRNA locus of *Entamoeba moshkovskii* in our study isolates, of which five SNPs potentially associated with specific coinfection incidence. For example, 722 T/C (p=<0.0001) transition was found to be associated with *Entamoeba histolytica* co-infection(IEH). 814 T/G transversion (p=0.0142) and 826 T/A transerversion (p=0.0142) also exibited a strong association with diarrhea causing bacterial or viral co-infection (IB/V). Only, 1345 T/G (p= 0.0424) and 1361 A/G (p=0.0424) showed positive correlation with sole infection of *E. moshkovskii* (Table 9). Genetic diversity indices revealed a total of 28 segregating sites (S) and 10 haplotypes (*h*), as well as haplotype diversity (HD) of 0.677±0.057 and nucleotide diversity (π) of 0.00336±0.00100. The haplotype diversity for different coinfected subgroups ranges from 0.400±0.237 to 0.633±0.074 and the nucleotide diversity (π) ranges from 0.00055±0.00032 to 0.00609 ±0.00266 across all sites. Each co-infected and sole *E. moshkovski*i infected subgroup (Sole D) showed high degree of haplotype diversity, accompanied by very low nucleotide diversity. The negative and significant Tajima's D and Fu's Fs statistical values were obtained across all the study isolates also indicating population expansion or positive selection. Neutrality tests results indicated population expansion or positive selection (Table 10). The highest FST value was detected between co-infected subgroup IEH against subgroups ISTH (FST value 0.34783). Whereas, the co-infected subgroup IOEP against IB/V exhibited lowest FST value (FST value 0.000) in all possible combinations of co-infected subgroups (Table 11). Overall, the estimated genetic differentiation among nine combination of the co-infected subgroups was highly statistically significant (X2=77.195, P<0.001). Therefore, the obtained subgroups might be genetically isolated and corresponds to the speciation process.

Table 9 : SNPs/ insertion-deletion identified in 18S rRNA of *E. moshkovskii* study isolates.

SNPs	PVALUE	X^2, df	Significance	Associated group
722 T/C	<0.0001	34.24, 4	Yes	IEH
788 T/C	0.864	1.286, 4	No	_
814 T/G	0.0142	12.46, 4	YES	IBV
826 T/A	0.0142	12.46, 4	YES	IBV
988 G/C	0.293	4.945, 4	No	_
1145G/A	0.1909	6.113, 4	No	_
1345 T/G	0.0424	9.884, 4	Yes	Sole D
1361 A/G	0.0424	9.884, 4	Yes	Sole D
1377 T/G	0.1448	6.836, 4	No	_
1437 G/A	0.2445	5.446, 4	No	_
769 A delete	0.3295	4.612, 4	No	_
795-796 T insert	0.3295	4.612, 4	No	_

Sole D : diarrheal patients solely infected with *E. moshkovskii*, IEH: *E moshkovskii* positive samples co-infected with *Entamoeba histolytica*, IOEP: *E moshkovskii* positive samples co-infected with other Enteric Parasites- *G. lamblia*, *Cryptosporidium spp*, ISTH : *E moshkovskii* positive samples co-infected with soil transmitted helminthes, IB/V: *E moshkovskii* positive samples co-infected with other diarrhea causing bacteria - *E. coli*, *Shigella* spp&*V. cholera* or virus-Rotavirus. , P: Correlation coefficient value of the particular association, df: degree of freedom, X2: Chi square value.

Table 10 : Genetic diversity indices and neutrality tests based on 18S rRNA sequences found in local isolates of *E. moshkovskii* in Kolkata. Haplotype_1 (Prototypes) was identical to Laredo strain of *E. moshkovskii*.

Subgroups	N	Haplotypes obtained	S	h	K	Hd +/-SD	Π +/-SD	Neutrality tests			
								Fu's Fs	Tajima's D	Fu & Li's D	Fu & Li's F
Sole D	30	Hap_1, Hap_2, Hap_3, Hap_4, Hap_5, Hap_6, Hap_7, Hap_8	9	8	1.42759	0.623 0.093	0.00195 0.00036	-2.506	-1.15479	-2.12379	-2.13591
IEH	6	Hap_4, Hap_6	3	2	1.60000	0.533 0.172	0.00218 0.00070	2.506	1.12414	1.39584	1.40624
IOEP	6	Hap_1, Hap_3, Hap_10	2	3	0.66667	0.600 0.215	0.00091 0.00038	-0.858	-1.13197	-1.15529	-1.19511
ISTH	5	Hap_1, Hap_8	1	2	0.40000	0.400 0.237	0.00055 0.00032	0.90	-0.81650	0.7715	2
IB/V	21	Hap_1, Hap_6, Hap_9, Hap_10	22	4	4.4667	0.633 0.074	0.00609 0.00266	5.167	-1.02116	1.35707	0.75547
Total	68		28	10	2.46313	0.677 0.057	0.00336 0.00100	-0.544	-1.83320*	1.85839*	0.58884

N: Sample size; S: number of polymorphic/segregating/variable sites; h: number of haplotypes; K: Average number of nucleotide differences; Hd: haplotype diversity; : π nucleotide diversity; *Statistically significant

Table 11: Genetic differentiation (FST) among different coinfected subgroups of *Entamoeba moshkovskii*.

Sub group	Sole D	IEH	IOEP	ISTH	IB/V
Sole D	0.0000				
IEH	0.27144	0.0000			
IOEP	0.09383	0.32000	0.0000		
ISTH	0.10412	0.34783	0.0000	0.0000	
IB/V	0.10865	0.11116	0.09665	0.10664	0.0000

Giardia duodenalis causes 280 million giardiasis cases annually. The mechanism contributing to disease involves both parasite and host factors. *Giardia* possesses an array of proteins like flavoproteins, SOR, NADH oxidase and flavo-hemoprotein (*glFlHb*) which are able to handle oxidative stress it encounters in host gut. These proteins are part of free radical detoxification system in *Giardia*. *Giardia* flavo-hemoprotein (*gFlHb*) plays an important role in managing oxidative stress, and potentially also in virulence. This parasites' genome harbors remarkable variability and is not well documented for these genes. Thus, the object of this study is to investigate the genetic variability of in *gFlHb* locus in local isolates found. Full length CDS of *gFlHb* gene from *Giardia* positive stool samples were subjected to sequencing. Sequence from each isolate was analyzed for single nucleotide variants (SNVs) and compared with reference sequence. Identical sequences were classified into haplotypes, and diversity was further analyzed. The prevalence rate of *Giardia* suburbs of Kolkata is 6.08%, with B3 as the prevalent (34.13%) and A2, A1 being less frequent human infecting subtypes. A total of 7 distinct sequences (haplotypes), representing different alleles of the *gFlHb* gene, were identified; 5 in B isolates (Haplotype diversity 0.836±0.080) [Fig. 28] and 2 haplotypes were identified in A isolates (Haplotype diversity- 0.4762±0.171) [Fig. 27]. The number of non-synonymous (ns)SNVs found is high in B subtypes (1.06%) than in A (0.4%) for *gFIHb* locus. This study reveals that *Giardia duodenalis* assemblage B harbors high allelic diversity for *gFlHb* gene whereas genetic variability in assemblage A is comparatively low. This heterogeneity may contribute to the parasites' adaptability under oxidative stress in host gut environment.

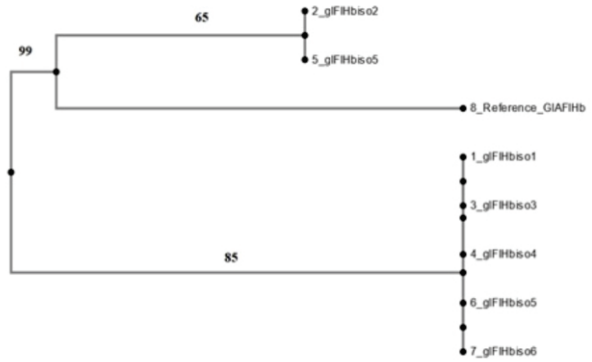


Fig 27: Phylogenetic analysis of local isolates of *Giardia lamblia*.

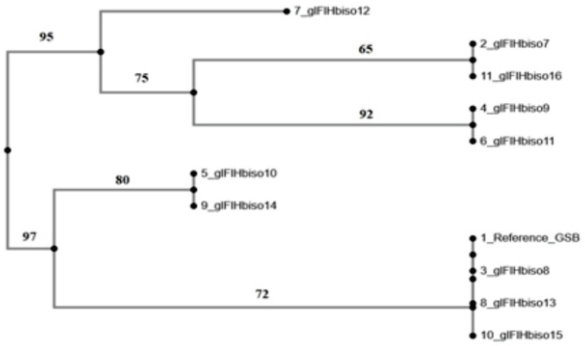


Fig 28: Phylogenetic analysis of *Giardia* isolates obtained from Kolkata and adjacent areas.

Isolation and molecular characterization of Tenascin in *Giardia lamblia* and its role in pathogenicity. Funded by CSIR (PI) 2017-2022

Giardia lamblia is a major causative organism of diarrheal diseases. Although they are known to cause diarrheal outbreaks every year in under developed countries, the mechanism of pathogenesis is still unknown. Tenascins are a family of extracellular matrix glycoproteins found in vertebrate embryos during development, organogenesis and in the stroma of tumors. Tenascin is a pathogenic factor in *Giardia lamblia* and stands out to be one of the less understood variants of tenascin as of yet. Containing EGF – like repeats such as its higher variant, it helps Giardia in pathogenesis as well as during encystation, the mechanisms of which are not yet understood. We have currently been able to co- culture Giardia lamblia Portland strain, Assemblage A1 with HT-29 human adenocarcinoma cells. We have also isolated the sequence of Giardia-Tenascin gene using Polymerase Chain Reaction and submitted it for sequencing. Sequencing PCR was done using specified primer sequences and using BigDye™ Sequencing kit. The procedure was carried out using Sanger Sequencing methods. Afterwards, the sequence was submitted to NCBI GenBank (Accession number- MW962242). In order to clone and express the gene we have prepared specialized cloning primers with incorporated restriction sites. Presently we have isolated the gene after performing Reverse transcriptase PCR and have cloned it into pET28a cloning vector (Fig 29). Next, we will express the protein followed by antibody generation and characterization.

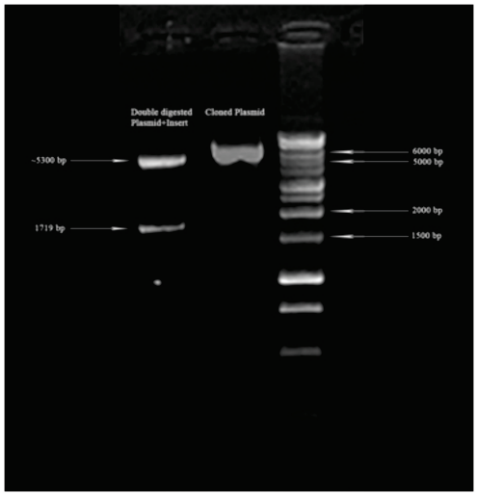


Fig 29: Double digestion of cloned in pET28a plasmid using BamHI and HindIII restriction enzymes.

Identification of novel Anti-Parasitic Compound from Natural Medicinal source and their effect on *Giardia lamblia*. Funded by CSIR (PI) 2018-2029

Giardia lamblia, a common water and foodborne parasite, frequently causes diarrhoea. Prevalence of giardiasis is higher in immunocompromised (children and elderly) people living in poor, unhygienic conditions in developing countries. We assessed the mortality of *Giardia lamblia* exposed to different concentration of *A. paniculata* aqueous extract. The percentage of cell death differs with the extract concentration. Dose of 1mg/ml killed nearly 50% of the cells in 24 hours. Doubling the concentration to 2mg/ml leads to killing of 95% of the cells. 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 1mg/ml. The cell death activity and adherent property have shown the good result also. Andrographolide (Active compound of *Andrographis paniculata*) exhibited 96.67% inhibition at concentration of 2µg/µl for 24hrs of treatment and it was compared to metronidazole which provided 80.67% of cell death at same concentration (Fig 30). $IC50_{24hrs}$ of andrographolide (1.2µg/µl) was significantly lower ($t=8.11$, $df= 4$; $p<0.0013$) than metronidazole (1.0µg/µl). We also noticed a degenerated morphology of *Giardia trophozoites* after treated with increasing concentration of Andographolide.

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.

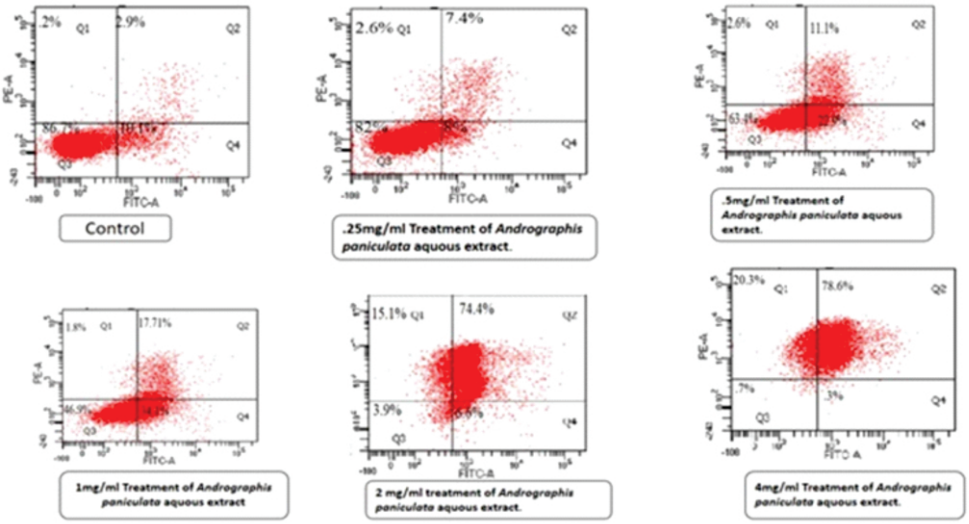


Fig 30: The figure depicts the results of a flow cytometry analysis of cells that were stained with FITC-PI and treated with various concentrations of *Ap* extract.

Human pulmonary paragonimiasis is crab eating communities and smear negative suspected TB cases from some states of India.

Paragonimiasis Disease symptoms (including cough, fever, blood in sputum, etc.) can be similar to those observed in patients with tuberculosis or bacterial pneumonia, frequently resulting in misdiagnosis. We surveyed (April 2021 - March 2022) through baseline data (RNTCP/DOT/PHC) to identify individuals with common symptoms and collect serum, sputum and stool samples from them.To determine the prevalence rate in India, we started with community based surveys (Active and passive) in freshwater-crab eating communities and smear negative TB cases from two districts of West Bengal (South 24-paraganas & Alipurduar). 7319 freshwater crabs (Telo-kankra) were dissected to confirm the presence of metacercaria. Two identified (*Sartoriana spinigera* (Telokankra)*, Acanthopota monmartensi*) and one unidentified species of crab were found. In active surveillance this year we surveyed 10647 individuals and we collected 8360 blood samples 8002 stool samples and 9504 sputum samples.In passive surveillance this year we surveyed 30 PHC/DHC/RNTCP (in South 24-paragana 27 and in Alipurduar 3) and collect TB smear negative data.

This year 2497 patients were Passive surveyed 1698 Blood, 2120 stool and 2497 sputum samples were collected. Last year we tested in total 4903 serum active serum samples, among them 1.89% positive result in North Bengal and we tested in total 951 passive serum samples, among them 0.94% positive results found in South 24 parganas. Rest of the samples is stored in -20 ºC temperature. Next we are awaited for more indigenous ELISA tested kit developed by ICMR-Dibrugarh for assay of the collected samples. This work would help us in providing the incidence rate of Paragonimusspp in crab eating communities in two districts as well as in West-Bengal which in turn gives a prevalence map for this parasite in eastern India. We eagerly waited to survey more thoroughly to detect out Paragonimiasis disease and it will help us to create a prevalence map of this disease.

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

- E-poster competition, 2021. Organized by Indian Academy of Tropical Parasitology.

Patent(s) filed/accepted /Technology developed

- Sardar SK, Dutta S, Ganguly S. 2021. Development of a highly specific and sensitive genus targeted PCR assay technique for detection of nine Entamoeba spp. followed by a single round multiplex PCR assay for differentiation of three morphologically identical species Entamoeba histolytica, Entamoeba dispar and Entamoeba moshkovskii. Patent Filed: August 9, 2021. Intellectual Property Rights and Technology Transfer, ICMR. India.

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Subtilisin secreted by Bacillus amyloliquefaciens induced tubulin degradation and apoptosis in breast cancer cells by ubiquitin-proteasome mediated pathway

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 (Fig-31A). All the 5 strains were tested in HT29 (colon cancer cells) for apoptotic effect. Flow cytometric analysis showed, one strain DHS 96 can induced apoptosis which was inhibited by PMSF (Fig-31B). 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 (Fig-31C). 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 induced conventional pathway of apoptosis; rather it induced tubulin degradation in cancer cells, whereas in normal cells (MCF-10A) tubulin degradation was not observed (Fig-31D). In-depth analysis showed 'subtilisin' activates ubiquitination and proteasomal mediated tubulin degradation which was completely restored when proteasomal inhibitor MG132 was used (Fig 31E, G and H). We found subtilisin could not enter into the cells, rather it binds with the surface of MCF-7 (Fig F). We further observed PARKIN, one of the known E-3 ligase over-expressed and interact with tubulin in 'subtilisin' treated cells and there is reduced ubiquitination of tubulin observed when Si-RNA against PARKIN was used (Figure-31 I, J). 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. 31 K, L).

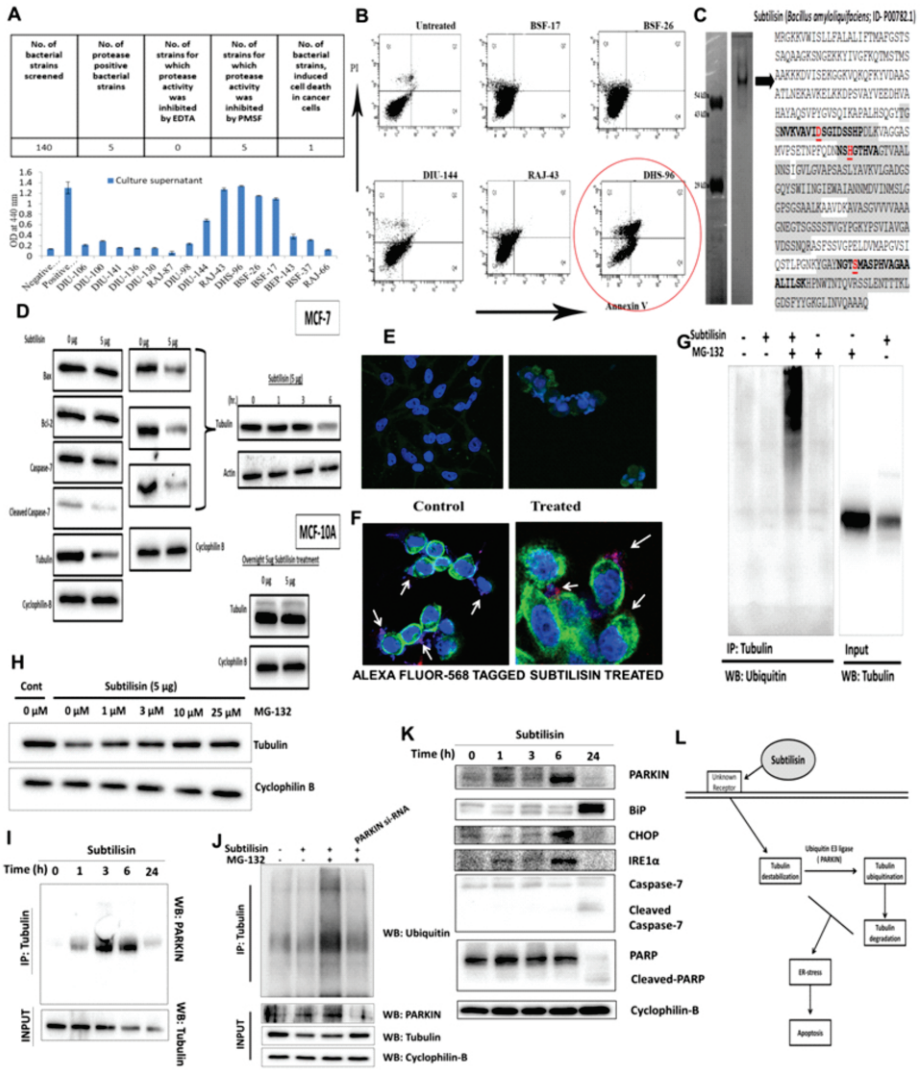

Fig 31: (A) Total number of strains screened with protease and apoptosis positive strains along with their inhibition pattern is represented in a tabular form. Azocasein (0.7%) assay was done to check the protease activity for all 140

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)Representative confocal images of Alexa-568-subtilisin (orange) treated MCF-7 cells. White arrow-head showing subtilisin binds to the cell surface of MCF-7 cells. Cells cytoplasm was stained with DyLight-488 phalloidin (green) and nucleus was stained with DAPI (blue).(G)Subtilisin showed ubiquitination of tubulin in MCF-7 cells. (H)Proteasomal inhibitor MG-132 restore tubulin degradation in MCF-7 cells in a dose dependent manner. (I) Co-Immunoprecipitation showed E3-ligase PARKIN interacts with tubulin in 'subtilisin' treated after 3 hrs onward. (J)Reduced tubulin ubiquitination observed when si-RNA against PARKIN used. MCF-7 cells transiently transfected with PARKIN-siRNA and tubulin IP was done using anti-tubulin antibody. Western blot of ubiquitin developed using anti-ubiquitin antibody.(K) 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 (L) 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
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Pre-Doctoral Fellow:
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Mr. Niraj Nag, SRF-UGC
Mr. Saibal Saha, SRF-UGC

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

Surveillance and molecular characterization of Group-A Rotavirus and other enteric viruses among children reporting with acute gastroenteritis

Mamta Chawla Sarkar (PI), Alok Deb (Co-PI), Pallavi Indwar (Co-PI)

The surveillance and molecular characterization of enteric viruses aims to assess baseline data prior to and post-introduction of RV vaccine in West Bengal. Vast diversity in the RV genotypes and rapid emergence of novel types due to recombination in developing countries raise concern, thus monitoring the strain diversity is important. From April 2021-March 2022, 347 stool samples were collected from the outpatient department of B. C. Roy Children's hospital of which 14.70% (n=51) were RV positive. Norovirus (3.46%), Adenovirus (7.78%), Astrovirus (2.02%) and Sapovirus (3.17%) were observed at low frequency. Compared to data from 2010-2018, there is significant reduction in RV infection rates in the region. Frequency of Rotavirus and Adenovirus induced gastroenteritis was higher among children belonging to 6-24 months while the highest Sapovirus and Astrovirus infections more were observed among children aged between 36-60 months. Norovirus infection was highest among children of 6-12 months age group followed by 24-36 months age group. (Fig 32)

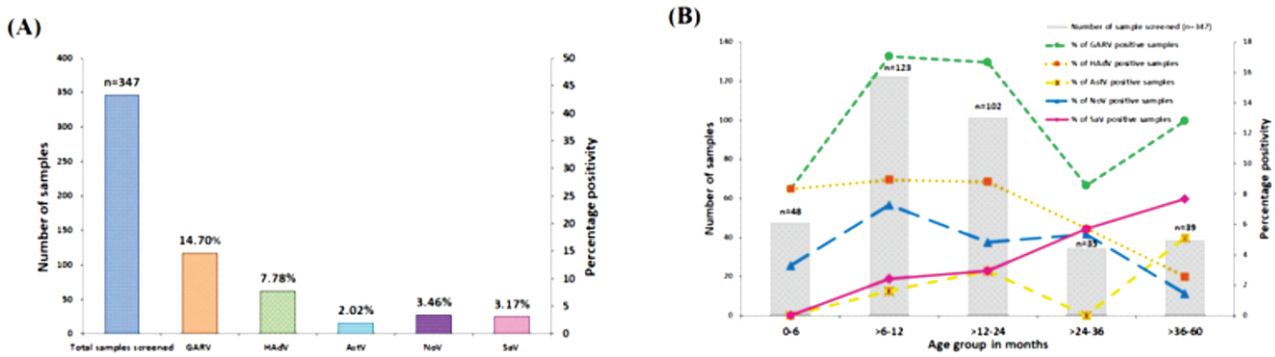


Fig 32 : (A) Diversity of enteric viruses among children with acute gastroenteritis during Apr'21-Mar'22 in Kolkata. (B) Age groupwise distribution of different enteric viruses among children (≤ 5 years) with acute gastroenteritis during Apr'21 - Mar'22 in Kolkata.

During 2021-22, we did genotypic characterization of the archived samples (April 2017- March 2020) with specific focus on enteric Adenoviruses. HAdV genotyping was carried out by conventional polymerase chain reaction (PCR) which was then followed by DNA sequencing. Nucleotide BLAST software was used for the genotyping and phylogenetic analyses were conducted by MEGA X. Among the HAdV positive samples one-third of the samples were typed of which HAdV type 41 was predominant with 63.33% positivity (n=76/120) and the rest of the samples were HAdV type 40 (n=44/120; 36.67%).

Host-Rotavirus Interaction Studies: The cross talk between rotavirus and cellular nonsense-mediated mRNA decay (NMD) pathway

Mamta Chawla Sarkar (PI)

Nonsense-mediated mRNA decay (NMD), a cellular RNA quality system, has been shown to be an ancestral form of cellular antiviral response that can restrict viral infection by targeting viral RNA for degradation or other various mechanisms. In support to this hypothesis, emerging evidences unraveled that viruses have evolved numerous mechanisms to circumvent or modulate the NMD pathway to ensure unhindered replication within the host cell. In this study, we investigated the potential interplay between the cellular NMD pathway and rotavirus (RV). Our data suggested that rotavirus infection resulted in global inhibition of NMD pathway by downregulating the expression of UPF1 in a strain independent manner. UPF1 expression was found to be regulated at the post-transcriptional level by ubiquitin-proteasome mediated degradation pathway. Subsequent studies revealed rotaviral non-structural protein 5 (NSP5) associates with UPF1 and promotes its cullin-dependent proteasome mediated degradation. Furthermore, ectopic expression of UPF1 during RV infection resulted in reduced expression of viral proteins and viral RNAs leading to diminished production of infective rotavirus particles, suggesting the anti-rotaviral role of UPF1. Finally, the delayed degradation kinetics of transfected rotaviral RNA in UPF1 and UPF2 depleted cells and the association of UPF1 and UPF2 with viral RNAs suggested that NMD targets rotaviral RNAs for degradation. Collectively, the present study

demonstrates the antiviral role of NMD pathway during rotavirus infection and also reveals the underlying mechanism by which rotavirus overwhelms NMD pathway to establish successful replication. (Fig 33)

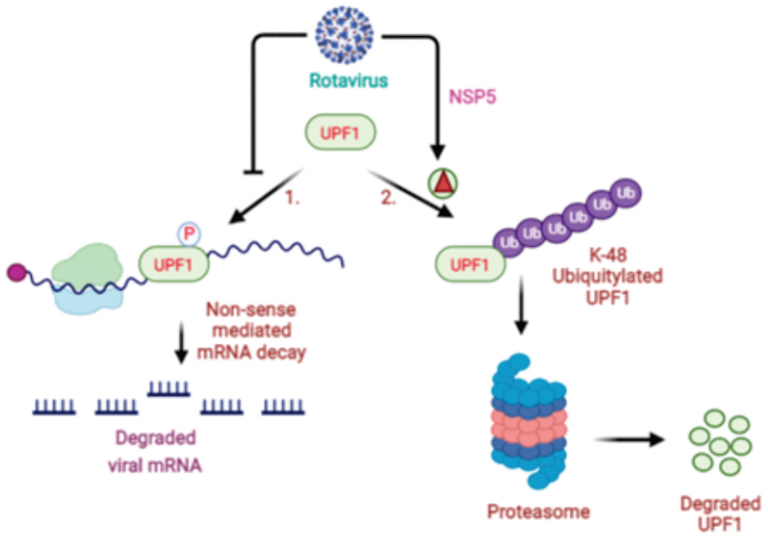
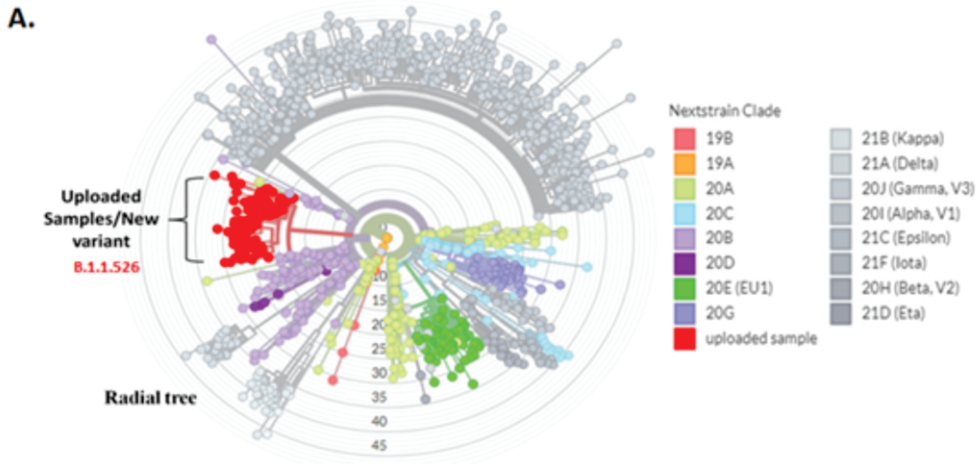


Fig 33: A schematic presentation of rotavirus induced subversion of nonsense-mediated mRNA decay(NMD).(1) UPF1, the master regulator of NMD, binds with rotaviral RNA and degrades them by NMD, leading to the inhibition of virus replication. (2) Rotavirus infection causes global inhibition of NMD by promoting NSP5-mediated K-48 lined ubiquitylationof UPF1 and its subsequent degradation by proteasome, thereby protects its RNAs from NMD mediated degradation.

Mutational analysis of circulating SARS-CoV-2 strains in India

Mamta Chawla Sarkar (PI)

Since its inception in late 2019, SARS-CoV-2 has been evolving continuously by procuring mutations, leading to emergence of numerous variants, causing second wave of pandemic in many countries including India in 2021. To control this pandemic continuous mutational surveillance and genomic epidemiology of circulating strains is very important to unveil the emergence of the novel variants and also monitor the evolution of existing variants. SARS-CoV-2 sequences were retrieved from GISAID database. Sequence alignment was performed with MAFT version 7. Phylogenetic tree was constructed by using MEGA (version X) and UShER. In this study, we reported the emergence of a novel variant of SARS-CoV-2, named B.1.1.526, in India. This novel variant encompasses 129 SARS-CoV-2 strains which are characterized by the presence of 11 coexisting mutations including D614G, P681H, and V1230L in S glycoprotein. Out of these 129 sequences, 27 sequences also harbored E484K mutation in S glycoprotein. Phylogenetic analysis revealed strains of this novel variant emerged from the GR clade and formed a new cluster. Geographical distribution showed, out of 129 sequences, 126 were found in seven different states of India. Rest 3 sequences were observed in USA. Temporal analysis revealed this novel variant was first collected from Kolkata district of West Bengal, India. The D614G, P618H and E484K mutations have previously been reported to favor increased transmissibility, enhanced infectivity, and immune invasion, respectively. The transmembrane domain (TM) of S2 subunit anchors S glycoprotein to the virus envelope. The V1230L mutation, present within the TM domain of S glycoprotein, might strengthen the interaction of S glycoprotein with the viral envelope and increase S glycoprotein deposition to the virion, resulting in more infectious virion. It was hypothesized that the new variant having D614G, P618H, V1230L, and E484K may have higher infectivity, transmissibility, and immune invasion characteristics, and thus needed to be monitored closely (Fig 34).



B.

Gene name	Mutation(s)
NSP4	D279N, L353F
NSP8	V26F
NSP12	P323L
S	D614G, P681H, V1230L, ±E484K
NS3	G172C
NS8	V62L
N	R203K, G204R

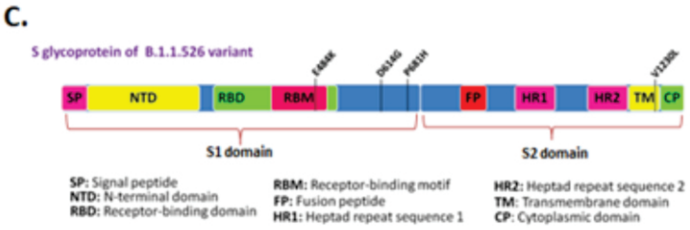


Fig 34: (A)Molecular phylogenetic analysis of the new variant B.1.1.526 by UShER.The phylogenetic tree depicting the position of 129 strains of the new variant (labelled as uploaded sample/new variant, red color) within the 1127 SARS-CoV-2 strains of different clades or variants. Each color is representing a different clade/lineage. (B) List of 12 coexisting non-synonymous mutations present within 7 different proteins of the B.1.1.526 lineage(C) A schematic illustration of S glycoprotein mutations found within the B.1.1.526 lineage.

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Ms. Suvrotoa Mitra, DHR- Women Scientist

A. Chakrabarti (Principal Investigator), Virology Division

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

Over last few decades, Vibrio phage reference laboratory is engaged in phage typing study of *V. cholerae* O1 biotype ElTor strains and *V. cholerae* O139 strains using conventional phage typing scheme of Basu and Mukherjee and the phage typing schemes developed in this Institute. Under the unexpected COVID-19 pandemic situation over last couple of years, regular sample arrival from different hospitals were interrupted. However, this year we have received a total of 170 samples from different cholera endemic regions and hospitals in India for characterization and phage typing analysis. Strains received were confirmed as *V. cholerae* O1 biotype ElTor. Serological identification was carried out with each of the strain by using polyvalent O1 and consequently monospecific Inaba and Ogawa antisera. All the strains were characterized by phage typing using a panel of typing phages available with us at the Vibrio Phage Reference Laboratory.Phage typing was performed using the sets of typing phages available with us using the conventional phage typing scheme of Basu and Mukherjee and New phage typing scheme developed at NICED. Most of the strains received were identified as *V. cholerae* O1 biotype ElTor, Ogawa. Strains were discriminated into two different types using the conventional phage typing scheme of Basu and Mukherjee. However, new phage typing scheme discriminated the strains into six different types. The phage type 27 was found as the predominant type followed by type 25.

Isolation of new bacteriophages is ongoing to improve the existing phage typing scheme.
We have isolated new phages against V.cholerae O1, Shigella and Salmonella sp. New pahges isolated for *V. cholerae* O1 biotype ElTor which are under characterization.

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

Targeting 14-3-3 eta protein as a therapeutic target against Influenza virus.

Influenza A virus highly anticipates on a tight meshwork with its host, exploiting host-cell proteins for its own purposes. E3 ligase TRIM32, which ubiquitinates PB1, thereby leading to PB1 protein degradation and limiting viral infection. When TRIM32 is phosphorylated, 14-3-3 proteins attach to it and stop TRIM32 from auto-ubiquitylating. TRIM32-containing cytoplasmic bodies formation is potential autoregulatory mechanism that can reduce the concentration of soluble free TRIM32. Protein-kinase- A-catalysed phosphorylation of TRIM32 at Ser651 will inaugurate the interaction of 14-3-3–TRIM32. Recent research has connected 14-3-3 to a number of RNA and DNA viruses that may help in the aetiology and development of infections. Therefore, surveilling and contriving 14-3-3 proteins may represent new targets for diagnostic and therapeutic purpose towards virus infections.

PB1 gene of Influenza A virus, 14-3-3η coding sequences and TRIM32, antiviral host factor was cloned into mammalian expression vectors PCMV 6A (Flag tagged) and pcDNA 6B (His tagged) for studying the functional importance of PB1, viral polymerase, rather than its role of polymerization via Co-immunoprecipitation. Eight segments of Influenza A virus were cloned into pHW2000 vector and was transfected into HEK293 cells and a wild type WSN/33 virus has been rescued using reverse genetics system. This will be useful to study the role of different viral proteins especially PB1 polymerase. The expression of chaperone Protein 14-3-3η, 14-3-3γ, 14-3-3θ, Protein-kinase-A, Trim32 and Phosphorylated Trim 32 were observed via western blot analysis with cell lysate samples collected in different time point post viral infection.

Future plan: Interaction between PB1, TRIM32, chaperone Protein 14-3-3 (acting as a scaffold protein in this pathway) and Protein-kinase- A will be analysed in details by co-immunoprecipitation, followed by co-immunoblotting and bioinformatics analysis.

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

Trim32 is E3 ubiquitin ligase that is important for ubiquitination of foreign proteins for normal regulation of cellular processes. As per the assumption based on the binding sites, interactions between Trim32 and PB1-N40 may play important role in virus infection.

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.PB1-N40 deleted mutant clone was prepared by site-directed mutagenesis, and amplification of whole second segment of influenza A virus by Hoffman universal primer and cloned into pHW2000 and pAc-GFP-C2 vectors. This was used to generate PB1-N40 deleted virus using reverse genetics system.

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

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

Indian Network of population-based Surveillance Platforms for Influenza and other Respiratory viruses among Elderly (INSPIRE) is a multi-centric project to understand the status of influenza in elderly populations in Eastern part in India. This project was formulated to estimate the burden of Acute Respiratory Infection (ARI) and associated Influenza virus (Influenza A and B) and Respiratory syncytial virus (RSV) infections in terms of incidence at community level, outpatient clinic visits, hospitalization and mortality among the elderly (≥ 60 years) population. Acute respiratory illnesses (ARIs) are the major obstacle for a community-based population of all ages, but the clinical imageries of virus infection in older adults are inadequate. Community and hospital based surveillance was conducted for assessment of Influenza A and B virus in Acute Upper Respiratory Infection (AURI) and Acute Lower Respiratory Infection (ALRI).A total of six hundred sixty-six (666) samples were collected from April 2021 to March 2022. Samples were classified into five groups based clinical status of the participants. Based on the clinical status groups classified into acute upper respiratory tract infection (AURI); acute lower respiratory tract infection (ALRI); corona like illness (CLI); AURI with the CLI, and ALRI with the CLI and the number of samples within the group were 108, 9, 95, 402 and 52 respectively. Primarily, all the samples were tested to detect the Influenza A, B and RSV viruses, followed by subtyping of the influenza A and B samples. In addition, a total of 549 CLI-associated samples were tested for SARS-CoV-2 infection. Out of 666 samples, only 10 samples were found positive for InfA/pdm09 H1N1, 22 samples were found positive for InfA/H3N2 virus and 9 samples found positive for InfB/Victoria subtypes. Whereas, 76 out of 549 CLI-associated samples were found positive for SARS-CoV2 infection. All the specimens were tested using real-time reverse transcriptase PCR (RT-PCR) for detection, typing, subtyping, and lineage of influenza viruses (A (H1N1) pdm09, A (H3N2), B (Victoria), and B (Yamagata) viruses). Results indicate less prevalence of influenza in COVID pandemic situation. The present study will help to understand the nature of circulating strain of influenza viruses among the elderly population.

Future plan: This study will continue in its current format to understand the prevalence of influenza among the elderly population.

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

- Provided training to a group from AIIMS Kalyani on real time RT-PCR detection of virus from clinical samples and delivered a lecture on Basics of PCR and Real time PCR
- Delivered a lecture entitled "Emerging and re-emerging high-risk pathogens and role of containment laboratories" 3rd Training Workshop on Biosafety and Biosecurity organized by VRDL, ICMR-NICED on October 26, 2021.
- Delivered an invited lecture in a Research Methodology Interactive session organized by New Alipore College Research Cell, New Alipore College, Kolkata on 27-02-2022
- Attended workshop onOne Health, data and models for zoonotic disease management Online training Courseconducted by CMR-NIE in collaboration with UK-Centre for Ecology during Nov 2021 to Jan 2022
- INSPIRE-II review meeting on Strengthening/ Promoting evidence based advocacy for influenza prevention and control in India"conducted byAIIMS New Delhi between 25-08-2021 to 27-08-2021 at Marriot Courtyard in Chennai.

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A. Majumdar (Principal Investigator), Virology Division

Genomic and phylogenetic analysis of human respiratory adenovirus circulating in Eastern India.

The project was conceived with the aims to identify the circulating and predominant serotypes of human respiratory adenovirus in Eastern India and find if there is any correlation between HAdV serotype and severity of disease, the prevalence and seasonality of the HAdV and to evaluate HAdV associated outbreak potential is this region.

SAC and IEC approval has been received for the project. Respiratory samples (NP/OP swabs) from cases of ILI/SARI received at Regional VRDL, ICMR-NICED, since September 2018 were included in the study. Multiplex real time PCR was performed to find out the viral aetiology. Typing of the HAdV samples were based on the Hexon genes hypervariable region 1-6. Among the 21 HAdV positive samples from January 2021 to March 2022, 10 were typed and considered for further phylogenetic analysis. Among 152 HAdV positive samples from September 2018 to January 2020, 50% sample were typed (n=76).

In the time period of January 2021 to March 2022, 21 cases of HAdV were confirmed out of 976 patients presenting with respiratory tract infection with a positivity of 2.15% (n=21/976). HAdV infection was highest in the winter months from November to January. ARTI was highest among the 2-5 years age group followed by ≤ 2 years age group. HAdV infection was lowest among the ≥ 18 age group. HAdV type 7 was found to be the predominantly circulating genotype 80% (n=8/10) which has around 99-100% similarity with reference sequences obtained from China and USA. Rest 20% (n=2/10) samples were HAdV type 3. Interestingly, sequencing and phylogenetic analysis of the fiber gene has revealed that 4 of the HAdV type 7 sample has fiber gene of type 3. Hence, HAdV type 7/3 recombinant genotypes have been observed in this region.
In the time period of September 2018 to January 2020, 152 cases of HAdV were confirmed out of 1171 patients presenting with respiratory tract infection with a positivity of 12.98% (n=152/1171). Adenovirus infection was highest in the month of March - April although an increased positivity was observed in the winter months from December - January. The distribution of age group was similar to the cases from January 2021 to March 2022. HAdV type 7 was found to be the predominantly circulating genotype 78.95% (n=60/76) which has around 99-100% similarity with reference sequences obtained from China and USA. Rest 19.74% (n=15/76) samples were HAdV type 3 and only one sample (1.31%; n=1/76) was found to be HAdV type 4. All the 38-fiber gene typed during this study period clustered with the type B3 reference sequences including the 30 sequence that were typed as HAdV type B7. This indicates a recombination event between the hexon gene of HAdV type B7 and fiber gene of type B3.

Establishment of a network of Laboratories for managing epidemics and Natural Calamities (VRDL)

The Virus Research and Diagnostic Laboratory (VRDL) at ICMR-NICED is a regional laboratory established in 2015 under the auspice of VRDL Network under the Department of Health Research (DHR), MOH&FW, with the objectives of:

- Creating infrastructure for timely identification of viruses and other agents causing morbidity significant at public health level and specifically agents causing epidemics and/or potential agents for bioterrorism.
- Developing capacity for identification of novel and unknown viruses and other organisms and emerging/re-emerging viral strains and develop diagnostic kits.
- Providing training to health professionals.
- Undertaking research for identification of emerging and newer genetically active/modified agents.
- Continual improvement in quality systems in public health laboratories for viral diagnosis.

Active collaboration exists with VRDLs and Public Health facilities in West Bengal and Sikkim to provide diagnostic, training and research support. Being a regional centre, Virus Research and Diagnostic Laboratory (VRDL-NICED) was one of the first 13 VRDLs in the network to get activated to handle the COVID-19 pandemic besides NIV, Pune and NCDC, New Delhi. A total of 1.60 lakh samples were screened at VRDL for more than 30 viruses and other pathogens of public health importance (Table 12).

Table 12 : Viruses and other pathogens screened at VRDL.

Investigations Performed	Total No. of Samples Tested in 2021-22	Positive Samples	Positivity Rate (%)
SARS-CoV-2	159065	37298	23.45
Dengue NS1 ELISA	71	2	2.82
Dengue IgM ELISA	75	12	16.00
Chikungunya PCR	6	0	0
Chikungunya IgM ELISA	68	6	8.82
Japanese Encephalitis IgM ELISA	7	1	14.29
Hepatitis A IgM ELISA	117	26	22.22
Hepatitis E IgM ELISA	115	11	9.57
Hepatitis B Surface Ag ELISA	51	2	3.92
Hepatitis C Ab ELISA	17	3	17.65
Zika PCR	7	0	0
Scrub typhus IgM ELISA	166	31	18.67
Leptospira IgM ELISA	90	5	5.56
Influenza A-H1N1 PCR	1112	18	16.07
Influenza A-H3N2 PCR	1112	25	2.25
Influenza B PCR	1112	47	4.23
Respiratory RSV-A PCR	1112	0	0
Respiratory RSV-B PCR	1112	47	4.23
Respiratory hmPV-A1A2 PCR	929	302	32.51
Respiratory PIV-1 PCR	929	2	0.22
Respiratory PIV-2 PCR	929	32	3.44
Respiratory PIV-3 PCR	929	7	.75
Respiratory PIV-4 PCR	929	8	.86
Respiratory Adenovirus PCR	929	29	3.12
Respiratory Rhinovirus PCR	929	26	2.80

Completed analysis of serological and molecular testing data on dengue fever in Kolkata and adjacent districts during 2016-2019. It was submitted to IJMR and has been accepted for publication. Nanomaterials based improved PCR for detection of SARS-CoV-2 and extraction free direct method of RNA processing is being evaluated. Research activities on influenza, SARS-CoV-2, respiratory adenovirus, and respiratory syncytial virus have been initiated. The laboratory was assessed by the Inter-ministerial Committee for Certification of BSL-3 facility and based on recommendations of Review Committee on Genetic Manipulation (RCGM), the Certificate of Compliance for BSL-3 Facility was issued by Department of Biotechnology, Ministry of Science & Technology, GoI dated 30/11/2021. Outreach program on COVID-19 and other health topics were part of the effort to create awareness among masses. The laboratory also extended support to the different collaborative studies, ICMR coordinated multicentric research programs and vaccine trials.

Pan India Epidemiological, Virological and Genomic Surveillance for Human Influenza and COVID-19 through DHR-ICMR VRDL Network

A Referral laboratory has been established at ICMR-NICED under this and the laboratory is now equipped to initiate isolation, antigenic characterization, and gene sequencing of Influenza viruses. A total of 541 and 170 samples were collected from twelve hospitals and four community settings respectively. Total of 17 positive clinical specimens were dispatched to NIV Pune [INF-A (2), INF-B (14), SARS-COV-2 (1)] for virus isolation and genetic characterization. Total 10 QC samples were dispatched to NIV Pune – concordance 94%. Cell line maintenance and cryopreservation are being done regularly. Work on virus isolation is ongoing. Funds for sequencing have been received and work will start soon. Two trainings were conducted by NIV, Pune for the research assistants on – 1. Cell culture and isolation; antigenic characterization – HA and HI, 2. Genetic characterization, gene sequencing: influenza HA and NA genes, SARS-CoV-2. Regular meetings were conducted by ICMR headquarter to check the progress of the project. Fortnightly reports are being sent updating the status of the cell culture laboratory.

WGS of SARS-CoV-2 from second wave to study the mutations

The study was conceived and conducted in collaboration with NIBMG Kalyani and IISc Bengaluru. Based on the clinical features, SARS-CoV-2 RNA from representative samples were identified, sorted, and transported to the sequencing facility at NIBMG, Kalyani. The results indicated high frequency of the delta variant in the second pandemic wave. In addition to several spike mutations in delta variant, mutually explicit signature constellations of non-spike coappearing mutations were identified driving the symptomatic and asymptomatic infections. The study has been completed and results have been submitted to peer reviewed journal.

Development of a Technical Framework for establishing comprehensive surveillance system for HIV/AIDS-related mortality in India

The project proposal was framed in consultation with WHO India, sanctioned and funds received. Experts in the filed were consulted who gave their insights and valuable opinion throughout the course of the study. Four full board technical resource group meetings were conducted. The proposed technical framework attempts to provide plausible approaches of HIV/AIDS associated mortality surveillance in the Indian context, and the document developed based on extensive literature review, relevant global guidelines, publications, and lessons learnt documents and through consultation with the experts of TRG. The technical framework proposed four different approaches (composed of both facility based, and community based) that includes- Civil Registration System with Medical Certification of Cause of Death; Antiretroviral Therapy Centre based implementation of Verbal autopsy; Community based surveillance with Verbal Autopsy; and, Sample vital registration with verbal autopsy (SAVVY) integrated with Sample Registration System. The implementation plan will involve exhaustive training of the personnel and a strong capacity building. The project has been completed and the final report has been submitted to WHO India. The report, which will be published by WHO India, is expected to provide suitable insights for considering plausible HIV/AIDS associated mortality surveillance in Indian context. The proposed mortality surveillance holds the transformation potential in making HIV associated mortality indicators useful for monitoring PLHIV health and their retention in treatment and care.

Conferences / Seminars /Workshops / Meetings / Trainings Attended

Topic of Trainings/ Conferences/ Seminars/ Webinars etc.	Conducted By	Period	
		From	To
Consolidating the Evidence, Building the Future: Consultation meeting on Integrated and Enhanced Epidemiology Under the National AIDS Control Programme in India	NACO	27 Aug 2021	29 Aug 2021
Regional Post-Implementation Review Meeting for HSS Plus 2021	ICMR-NICED	27 Oct 2021	28 Oct 2021
Training of trainers' workshop on Data Quality Guidelines	ICMR – NIMS and Population Council	02 Mar 2022	03 Mar 2022
eCourse on Health Research Fundamentals	ICMR - NIE	24 Jan 2022	23 Mar 2022

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

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

Objective:

i) Isolation and characterization of natural compounds like polysaccharides, terpenoids from some medicinal and edible mushrooms (Fungi)
ii) Screening of these isolated compounds as anti HCMV in vitro.
iii) To find out the mechanism of mode 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:

Initial objective was to find out a suitable ethno-medicinal source which can actively able to regulate the in-vitro propagation of Human Cytomegalovirus. For this purpose we have able to find out two mushrooms i.ePleurotus sp. and Lentinus sp. which showed promising responses against HCMV on both MRC5 ans 1B4 cell line. Our previous studies indicated that crude extracts of both these mushrooms effectively reduces the viral load (75%) in-vitro conditions when tested on both cell lines. Currently both these crude extracts have been tested on a specific modulated cell line 2F7 (constitutively expressing UL-54 gene expression when infected with HCMV in-vitro condition). crude extracts of both these mushrooms on 2F7 cell line showed 100% inhibition of HCMV replication at 150 µg/ml and 130 µg/ml respectively. Non polar solvent mixture of methanol: Hexane: Ethyl acetate (2:4:3) showed promising antiviral responses only in Pleurotus sp. Extract on 2F7 cell line. At 36 hpi the UL-54 gene expression was on constitutive cell line 2F7 as well as MRC5 and 1B4 cell line, which was reduced to 65%, 72%, 69% respectively.

Different extracellular enzymes have been isolated after culturing the mushroom fruit body in a suitable nutrient culture medium. One of the major enzymes (Laccase) has been identified to have promising anti-HCMV properties. The immediate early genes expression (IE-1, UL-54) has been studied thoroughly by both time dependent and dose dependent manner by using EC-50 concentration of the enzymes on all three cell lines. In all these cases the enzymes showed promising antiviral responses. Our next goal is to further purification of the said enzymes and decipher whether the compound has been absorbed within the cells through any cellular receptor and the exact mode of action of the compounds interacting domain with the viral immediate early responsive genes in-vitro condition.

Surveillance of foodborne disease pathogens from North-East India.

Objective:

1. To identify the pathogens causing foodborne diseases and outbreaks.
2. Evaluate the burden of the foodborne disease
3. Document regional and seasonal differences in the incidences of certain bacterial, viral and parasitic foodborne diseases
4. Genotyping and antibiotic sensitivity pattern of identified bacterial pathogens
5. Describe the transmission pathway of different foodborne diseases
6. Infrastructure development of culture, antibiotic sensitivity testing and molecular studies at the North East institutes for foodborne pathogens.
7. Public health action, i.e. awareness of water and food hygiene among the health workers, food handlers etc.

Outcome of the study:

We have tested the effectiveness of GastroFinder® 2SMART (GF) kits for the detection of life-threatening gastrointestinal diseases causing bacteria. These products have not been tested on food samples. A valid reason to test these approaches for foodborne pathogens is that any joint venture can use the techniques while investigating the food pathogens outbreak. Once diagnosed, routine screening can help isolate and better characterize the disease causing bacteria.

All samples (control samples) were collected by incubation in 5 ml of TSB at 37°C for 16-18 h, centrifugation at 4000 x g for 20 min at 4°C, and the supernatant discarded. Palletized cells were removed in sterile phosphate buffered saline (PBS) and centrifuged again. Bacterial suspensions were placed on the TSA and incubated at 37°C for 16-18 h.

Approximately 10 grams of fresh meat was brought in from the local market. For bacterial isolation, each 10 g sample was placed in a sterile Petri dish and prepared bacterial suspension culture followed by serial dilution.The suspended

bacterial cocktail from each dilution was applied to samples and incubated for 1 hour at the ambient temperature. The DNA was extracted from the bacterial suspensions using a Qiagen kit (Qiagen, Hilden, Germany) following the manufacturer's protocol Real-time PCR reaction was performed following the conditions specified in the manufacturer's instructions of Gastrofinder-2SMART (PathoFinder, Maastricht, The Netherlands) using Light Cycler-480 (Roche Applied Science, Penzberg, Germany).

Chicken meat sample contaminated with a combination of six pathogens at four different dilutions have been tested using GastroFinder RT-PCR kit. Salmonella spp., EPEC, ETEC and STEC were consistently detected in all the tested dilutions S. flexneri and Y. enterocolitica were not detected in the RT-PCR. The possible reason for this unusual result might be due to the sensitivity of the PCR amplicon (gyrBand ipaH) against the background of other four target genes. Multiplex PCR result showed that presence of major bacterial inocula in the tested samples were as follows- Salmonella (1.2x04 CFU/ml). ETEC (6.8x103 CFU/ml), STEC(5.0x102CFU/ml).

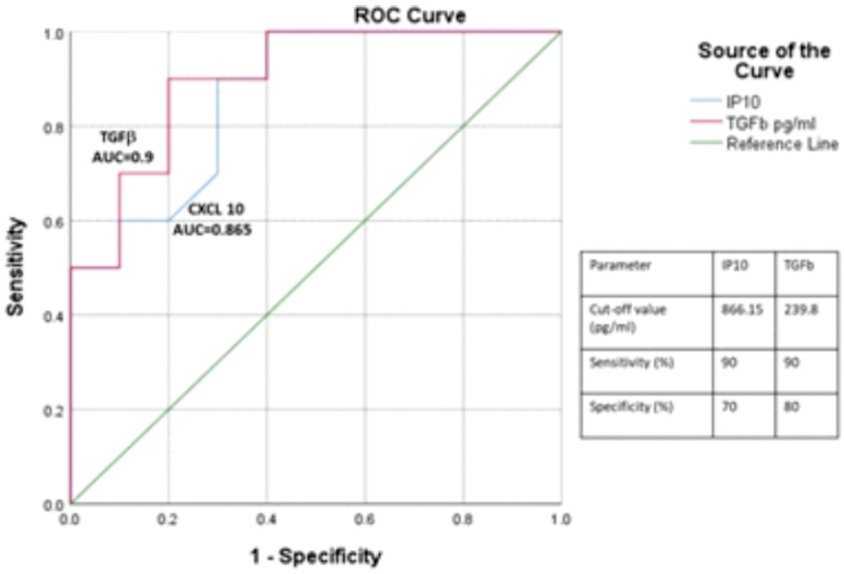
A comparative analysis depicting the disease characteristics and phylogeny of human cytomegalovirus infection in immunocompromized patients with end organ diseases

Objective:

1. To evaluate the exact clinico-physiological and immunological parameters that could predict the ongoing occurrence of HCMV induced end organ diseases in these patients.
2. To understand the sequence variability in a particular HCMV glycoprotein gene among the clinically isolated strains and utilize it to establish a phylogenetic relationship among them.

Outcome of the study:

Linear and logistic regression models were used to estimate different distinguishing parameters among immunocompromized seropositive patients with presence or absence of HCMV co-infection, as dependent variable and all other factors as independent variables. Expressions of various secretory cytokines like IL1□, IL8, TNF α, IFNγ, IL10 and IL6, etc. along with chemokines like MCP1, MIP1α, IP10, CXCL9 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 (Fig-35).



Parameter	IP10	TGFb
Cut-off value (pg/ml)	866.15	239.8
Sensitivity (%)	90	90
Specificity (%)	70	80

Fig35. Receiver operating curves (ROC) for identifying the significant biomarkers defining HCMV induced retinitis associated with best predictive accuracy (area under the curve > 0.8).

Our study indicated that in immunocompromized patients with a low CD4+T cell count, a HCMV co-infection generates an aggravated IFN response which thereby leads to the activation of the CXCL9/10/11-CXCR3 chemokine axis. Activation of this chemokine pathway further promotes an acute immune response and inflammation via the Stat proteins; Stat1and Stat3in case of the patients with retinitis and Stat4 in case of the patients with gastroenteritis (Fig-36).

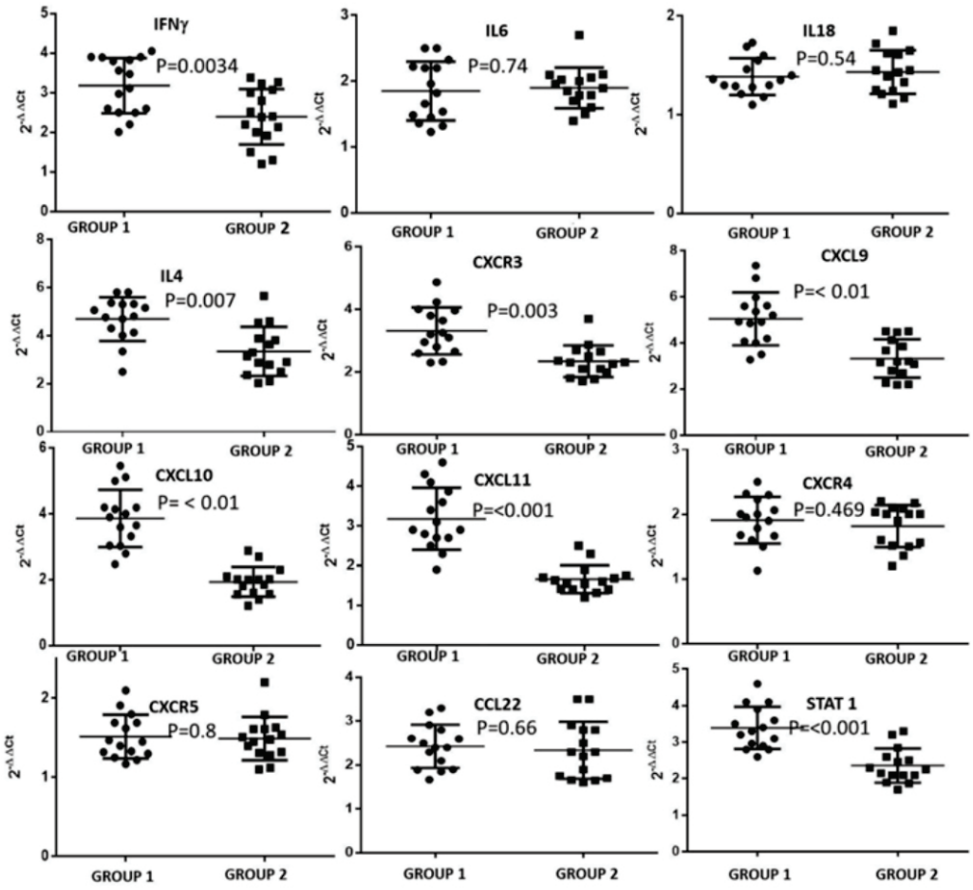


Fig36. Differential mRNA expression of some selected chemokines and cytokines from patients belongingto the two different groups (N = 15). Their relative mRNA expression ratio with respect to group 3 control group (Baseline expression) in terms of fold change (2−ΔΔCt) were estimated by quantitative real time PCR. GAPDH mRNA served as internal control (+ 1 value in Y axis 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.

Next we wanted to find out whether there exists any phylogenetic variation among the clinical strains causing either retinitis (HR) or gastroenteritis (HG) in the immuno compromized seropositive patients. We chose the gene for HCMV glycoprotein L (gL) or UL115 for this phylogenetic comparison as it is a major envelope glycoprotein that participates in the interaction of the virus with the cell surface markers and also promotes virus-cell fusion. The phylogenetic tree revealed that the gL gene sequences from the retinitis (HR) group mostly clustered separately from that of the group with gastro-enteric disease (HG) (Fig 37). Thus it may be suggested that a form of natural selection pressure is working on the clinical strains creating a divergence in their phylogenetic lineage thereby helping them adapt to the particular tissue microenvironment they are colonizing.

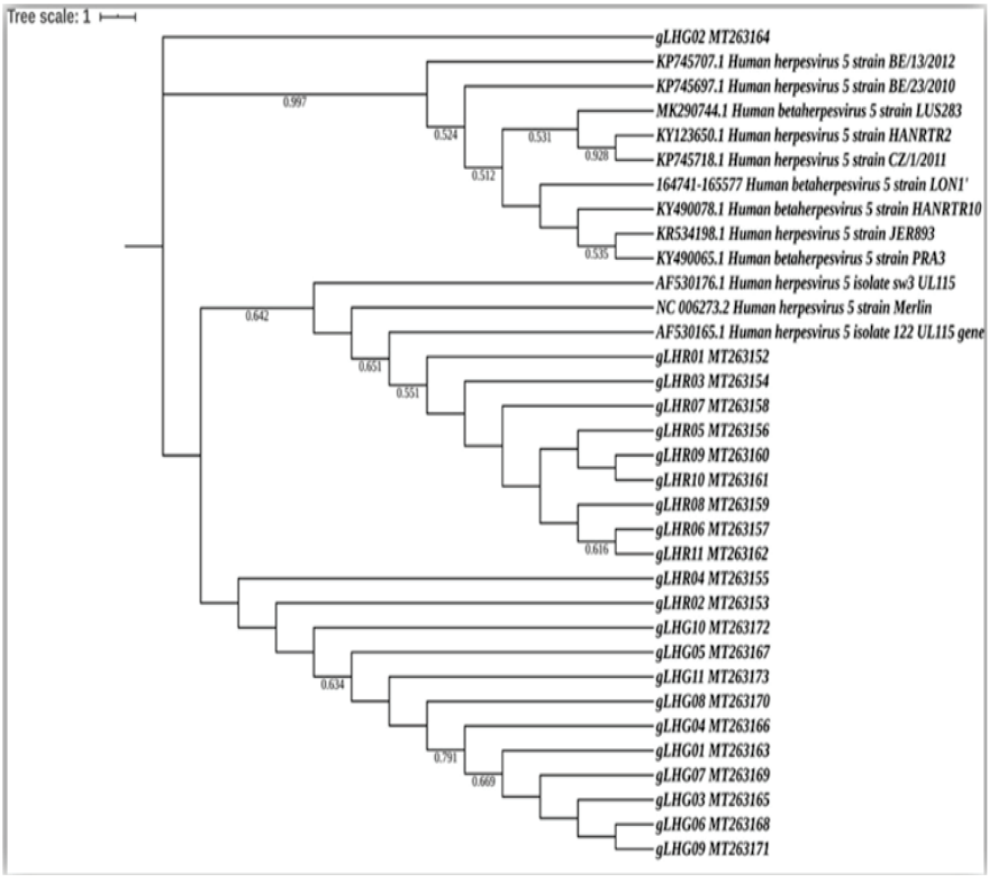


Fig37. Phylogenetic analysis of the partially sequenced HCMV gL genes from 22 clinical samples belonging to group 1 (11 HR and 11 HG samples) along with 12 standard reference gL gene sequences selected from NCBI database.

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

Hepatitis C virus drug resistance and the role of host immune factors

Principle Investigator:Provash Ch. Sadhukhan
Co-Investigator:Shanta Dutta, Mahaiuddin Ahammed, Partha Chattopadyay, Arunava Sarkar, Sujay Roy, Prasanta Chaudhary, Shymal Kanti Pal

Direct Acting Antivirals (DAAs) are used as the gold standard for treatment of hepatitis C virus infection. Although its efficacy is over 95% against of all HCV genotypes, but treatment failure has also been documented now. Thus to know the efficacy of DAAs against HCV genotype 3, the major circulating HCV genotype in India and the factors associated with HCV drug resistance needs to be studied. This study is initiated in collaboration with National Viral Hepatitis Control Programme treatment Centres in West Bengal. Blood samples were collected through our Clinical collaborators from National Viral Hepatitis Control Programme treatment Centres in different Medical College and Hospitals in West Bengal and processed for HCV genomic diversity and its mutational analysis.

A total of 160 HCV sero-reactive patients, who were planning for HCV-DAAs treatment, were recruited during this study period. Of the total patients, 115 patients belonged to high-risk groups like β-Thalassemia, CKD and 45 patients were belonged to general population with chronic liver diseases. Out of 160 patients, 82 (51.25%) were HCV RNA positive. Genotyping revealed that majority of hemodialysis patients infected with HCV genotype 1c (~71%) whereas multitransfused thalassemia patients were infected with genotype 3a (~82%). We have found HCV subtype like, 1c and 4a that were not reported earlier from this region. Interestingly, we also noticed very recently that HCV genotype 4a is circulated in small percentage within haemodialysis and thalassemia study population that was not reported frequently from this region. 61 patients have completed DAAs treatment till date. Of them, 37 were thalassemia patients and all of them achieved SVR12 (Sustainable Viral Response after 12 weeks). All the 10 CKD patients were also achieved SVR. Only one out 14 general populations with chronic liver disease treated patients was failed to DAAs treatment (Fig. 38). Genetic characterization of viral strain and the associated factors is ongoing.

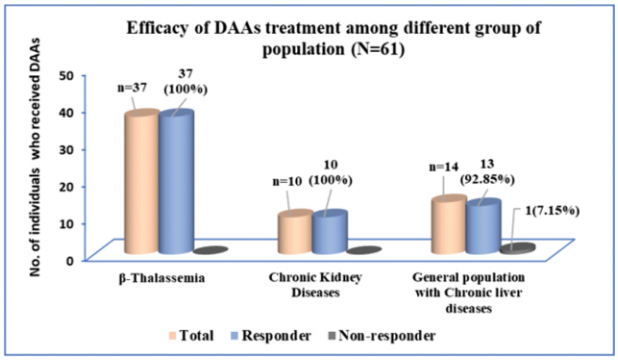


Fig 38: Efficacy of Direct Acting Antivirals among different population groups

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 during COVID-19 pandemic. Considering the consequences of secondary dengue infection, dengue serotyping is much needed in tropical and subtropical countries for better management of dengue fever and its early intervention.

After 2nd wave of Covid-19 pandemic in India, West Bengal suffered from dengue from July to end of November, 2021, especially after post monsoon season. A total of 1080 NS1 positive but COVID negative samples were received from different districts of West Bengal. NS1 positive samples were subjected to molecular serotyping to find the prevalent DENV serotypes circulating in parallel with COVID-19. Out of 1080 seropositive samples, 939 samples were processed and found 72% (n=677) was RNA positive. Among the RNA positive samples (n=677), 72.08% (n=488) were DENV3, being the prevalent serotype, followed by 18.31% (n=124) DENV2, 6.22% (n=42) DENV4 and the least 3.39% (n=23) was DENV1. The female to male ratio was 1:1.34 and the most affected age group was the adults 21 to 30 years. The number of dengue cases were underreported in 2021 as most of the dengue patients had not reported to hospitals due to the fear of COVID-19. In parallel to dengue serotyping, genotyping of DENV4 and DENV3 were also performed. During the start of the COVID-19 pandemic, DENV4 was the prevalent strain in 2020. In both the years i.e., 2020 and 2021, genotype 1 of DENV4 serotype was observed as a prevalent strain. In 2021, genotype 3 of DENV3 serotype was found to be the prevalent strain.

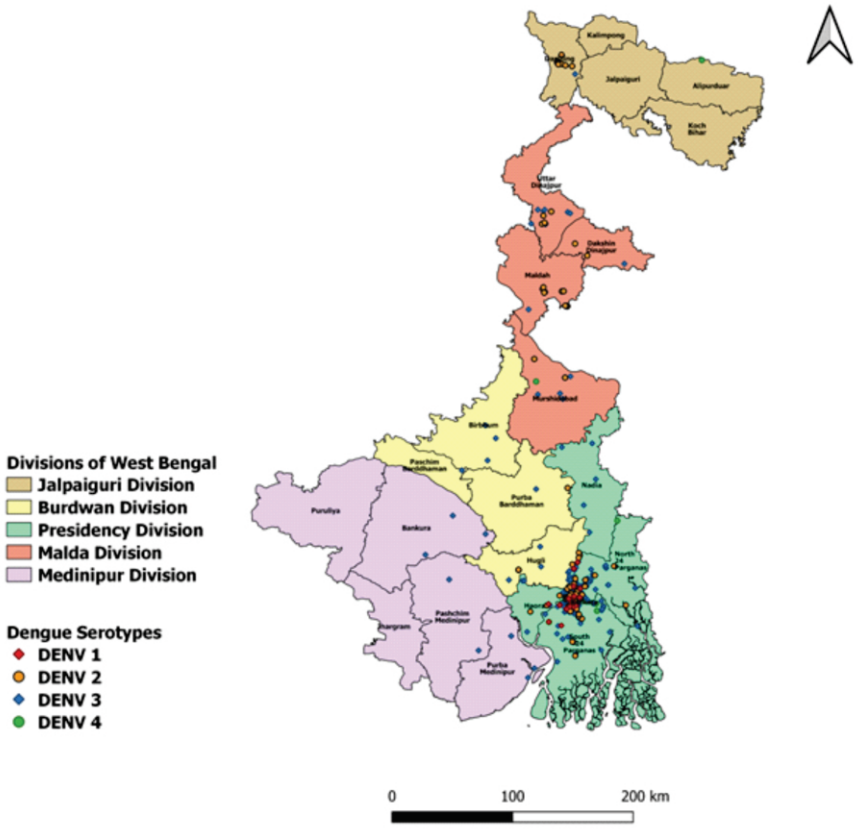


Fig 39: A quantum Geographic Information System (Q-GIS) based analysis of dengue serotypes in 2021. Maximum number of DENV cases was observed in presidency province with co-circulation of all the four dengue serotypes all over West Bengal during the year 2021.

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

Seminar (Offline)

- How existing public health system can be leveraged upon implementation on Antimicrobial Stewardship Program (AMSP) at peripheral health tiers. Organized by ICMR-NICED Kolkata, Nov. 18, 2021.
- Rising AMR burden; multi-sectorial efforts in India. Organized by ICMR-NICED, Kolkata, November 23 2021.

Webinars (Online)

- Pathbreaking contribution of ICMR - NIV in fighting COVID-19. Organised by Vigyan Prasar, DST, Govt. of India April 1,2021.
- International Symposium & Workshop on One Health in India: Research informing biosafety, preparedness and response. Organised by Indian Council of Medical Research, April 12,2021.
- Next Generation Sequencing and Data Analysis of the Viral Genome. Organised by Molsys Pvt. Ltd.,April 17,2021.
- Next Generation Sequencing and Transcriptome Data Analysis. Organised by Molsys Pvt. Ltd., June 1, 2021,
- Biodiversity means Health: from virus to vultures. Organised by European Union of India, June 5, 2021.
- MONITORING PLASTICS IN RIVERS AND LAKES: Guidelines for the Harmonization of Methodologies. Organized by Global Partnership on Merine litter (GPML) and World Water Quality Assurance (WWQA), Jun 7,2021.
- Importance of RT-PCR based COVID-19 testing. Organized by Thermo Fisher Scientific, India, June 17,2021.
- Methods and Approaches for Health Research in Social Sciences. Organised by ICMR-NIRTH, VIT-AP University and Central University of Karnataka, June 26, 2021.
- Biology of SARS-CoV-2. Organised by Merck, USA, June 30, 2021.
- Symposium on Implementation Research in Health: Perspectives, Relevance and Challenges. Organised by ICMR-NIIRNCD, JODHPUR, India, June 27, 2021.
- COVID-19: Changing scenario. Organised by ICMR-NICED, July 1, 2021.

- Explore Stem Cell Solutions from Takara Bio for COVID-19 Drug Discovery Research. Organised by Takara Bioscience India Pvt. Ltd., July 7, 2021.
- Mental Health Among Workers During COVID 19 Pandemic. Organised by NIOH-ENVIS RP. July 8,2021,
- Antimicrobial Resistance in the COVID-19 pandemic and post-pandemic period. Organised by World Society of Paediatrics Infectious Diseases, July 8, 2021.
- Impact of COVID-19 Variants, and the use of Advanced Toolsets for SARS CoV-2 Research. Organised by Krishgen Biosystem India Pvt. Ltd., July 16, 2021.
- Atypical Cell Wall of Mycobacteria: Its Relevance to TB, Treatment and Drug-resistance. Organised by ICMR-NIMR and MERA India in collaboration with John Hopkins University, July 19,2021.
- The Journey of an indigenous COVID – 19 vaccine. Merck India Pvt. Ltd., July 20, 2021.
- Virtual 28th Annual Scientific meeting of Indian National Association for Study of the Liver (INASL). Organised by Indian National Association for Study of the Liver (INASL), August 6, 2021.
- Harnessing potential of protein engineering to combat diseases. Organised by Tata Institute for Genetics and Society, August 10, 2021.
- The Changing Antigenic Anatomy of the SARS-CoV-2. Organised by NIMR and MERA-India, August 10, 2021.
- Society in Transition: Impacts of the Pandemic. Organised by German Centre for Research and Innovation (DWIH), September 8,2021.
- Big-Data' and Big-Ideas in Discovery and Application in the Life Sciences. Organised by ICMR-National Institute of Medical Statistics (ICMR-NIMS), September 27, 2021.
- Mass spectrometry-based proteomics and diseases. Organised by American Society for Biochemistry and Molecular Biology. USA, October 7, 2021.
- Open Science: a multifaceted framework to improve science and health outcomes. Organised by ICMR-Elsevier open Science webinar, October 29, 2021.
- Genes as a guide to human history and culture. Organised by ICMR-NIMR, November 8, 2021.
- Nature in the 21st Century-Holding up a mirror to science. Organised by Indian Academy of Sciences-Springer Nature in collaboration with the DBT e-Library Consortium (DeLCON), DBT/Welcome Trust India Alliance (India Alliance), November 11, 2021.
- Data Management Organised by ICMR-Elsevier open Science webinar, November 12, 2021.
- Quantstudio Absolute digital PCR organised by Thermo Fisher Scientific, November 18, 2021.
- Visceral Leishmaniasis-an update. Organised by ICMR-NIMR, India. November 22, 2021.
- Ethics of publication. Organised by ICMR-Elsevier open Science webinar, November 23, 2021.
- Translating Knowledge and Best Practices into Policy for Evidence Informed Decision making in Healthcare Sector for Universal Health Coverage. Organised by Department of Health Research, Ministry of Health and Family Welfare, Government of India, in collaboration with International Decision Support Initiative (iDSI), UK, December 10, 2021.
- Vaccinology. Organised by ICMR-Elsevier open Science webinar, December 20, 2021.
- Gene Delivery made easy: Lenti-X CRISPR/Cas9 Systems. Organised by Takata Bioscience India Pvt. Ltd., December 22, 2021.
- Modern Microscopy Methods in Clinical Diagnostics and Research. Organised by ZEISS Webinar in collaboration with Lawrence and Mayo: Modern Microscopy Methods in Clinical Diagnostics & Research. January 6, 2022.
- Changing Paradigm of diabetes management and diabetes reversal. ICMR-NICED February 28, 2022.
- In-Fusion Cloning Technology. Organised by Takata Bioscience India Pvt. Ltd., March 23, 2021.
- WHO Strategic Agenda for Filovirus Research and Monitoring (AFIRM). Organised by WHO R&D Blueprint team, March 30, 2022.
- 3rd sIPS 2022 on Peptides: Therapeutics, Biomaterials and Beyond. Organised by Indian Peptide Society, March 31 to April 1, 2022.

Training (Online)

- Climate Change and assessment of Dengue geography in India.
  Organized by Integrated Research and Development (IRADe), DST, India, August 12, 2021.
- One Health, data and models for Zoonotic disease management (Block 1).
  Organised by ICMR-NIE in collaboration with UK-Centre for Ecology, November 29, 2021.
- One Health, data and models for Zoonotic disease management (Block 2).
  Organised by ICMR-NIE in collaboration with UK-Centre for Ecology, December 9, 2021.
- One Health, data and models for Zoonotic disease management (Block 3).
  Organised by ICMR-NIE in collaboration with UK-Centre for Ecology, January 17, 2021.

Post and Pre-doctoral Fellows

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

SERVICES PROVIDED BY THE INSTITUTE

Pattern of assistance for Apex, NRLS and SRLS under the External Quality Assessment Scheme (EQAS) of NACO

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 State Reference Labs (SRLs) of A&N, Assam, Jharkhand, Meghalaya, Mizoram and Odisha.

NACO-NRL, ICMR-NICED conducts proficiency testing program for 12 state reference laboratories and their attached ICTCs where HIV testing is being performed directly from the patient. Confirmation of samples done as a part of EQAS during this period – 3096. This lab also conducts training program for 12 State Reference Laboratories of 6 states. Participated in PT program conducted by Apex Lab, ICMR-NARI, Pune and achieved 100% concordance. It also serves as testing centre for HIV Sentinel Surveillance (HSS) among Antenatal Clinic (ANC) attendees and prison inmates for West Bengal and High-Risk Group (HRG) for 5 states. HSS among ANC attendees and prison inmates for West Bengal: total sample received and tested for HIV and HBV – 2768. HSS among HRG for Nagaland, Mizoram, Tripura, Chhattisgarh & Meghalaya: total sample received and tested for HIV - 12158 (Table 2). Referral service provided for Command Hospital (EC), SRL Kohima and WBSAP&CS – 05 (Table 1).

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	02	02
2.	SRL, Kohima, Nagaland	01	Nil
3.	WBSAPCS	02	02

Table 2: HIV Sentinel Surveillance Plus 2021-22 (DBS for HRG): NRL, ICMR-NICED (Testing Lab.), Kolkata.

States	Sample			Result	
	Received	Rejected	Tested	Reactive	Non-reactive
Tripura	1282	Nil	1282	77	1205
Nagaland	3652	16	3636	90	3546
Mizoram	2473	6	2467	695	1772
Meghalaya	1269	Nil	1269	132	1137
Chhattisgarh	3521	17	3504	130	3391
Total	12197	39	12158	1124	11051

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 to monitor effectiveness of current practice of Prevention of Parent to Child Transmission (PPTCT).

EID lab of ICMR-NICED presently serves 1269 ICTCs in collection and testing of DBS samples in 14 states under NICED-RRL for DBS HIV-1 PCR. Total no of sample received and tested for HIV-1 qualitative PCR during this period – 3618 (Table 3). Scored 100% in the PT program conducted by CDC Atlanta.

Table 3: Status of EID DBS sample accepted and tested (with positivity of HIV-1) at ICMR-NICED from the period of April 2021 to March 2022.

Name of States	No. of DBS Samples Accepted	No. of DBS Samples Tested	No. of HIV-1 DNA Detected DBS Samples
West Bengal	596	611	46
Odisha	296	298	24
Chhattisgarh	772	790	29
Bihar	748	761	62
Jharkhand	100	107	26
Mizoram	259	259	24
Assam	203	210	20
Manipur	101	108	3
Nagaland	211	212	19
Meghalaya	211	211	17
Arunachal Pradesh	7	7	0
Sikkim	5	8	0
Tripura	30	31	2
A & N Islands	5	5	2
TOTAL	**3544**	**3618**	**274**

Consortium of NRLs for Kit Quality

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. ICMR-NICED, Kolkata is one of the four laboratories besides ICMR-NARI, Pune, NIMHANS, Bangalore and NCDC, Delhi as a member institute of Consortium.

Consortium Laboratory at ICMR-NICED, conducted evaluation of HIV, HBV & HCV diagnostic kits as per CDSCO guidelines, thus ensuring good quality diagnostic kits in the field of public health. Total no. of kits evaluated during this period – 38 (TAble 4).

Table 4: 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	10	10	09	09	09
HIV RAPID	00	NA	NA	NA	NA
HBsAg ELISA	10	10	10	06	06
HBsAg RAPID	01	01	01	01	01
HCV ELISA	15	15	15	15	15
HCV RAPID	02	02	00	00	00
TOTAL	38	38	35	31	31

The consortium is a self-sustaining body with its own mechanism of revenue generation through this kit evaluation process. ICMR-NICED generated an amount of 13,60,000/- during the financial year. The lab successfully completed the evaluation by CMS in collaboration with NACO and SHARE India for continuing the activities.

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 Re Assessment conducted by NABL in accordance with ISO 15189:2012.

Integrated Counselling and Testing Centre (ICTC)

Integrated Counselling & Testing Centre (ICTC) is key entry point to prevention, treatment and care of HIV and related infections. 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.
ICTC of ICMR-NICED provides basic information on modes of transmission and prevention to promote healthy behavioural 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 counselling to clients who are found HIV negative; follow-up counselling and testing, PEP distribution (if required); free condom distribution; cross referrals to RNTCP, STI, ART, TI-NGOs etc.
From April 2021 to March 2022 total 417 clients were tested for HIV in ICTC. Among them 13 were found positive (Table 5). All the HIV positive clients were linked to ART center, STI clinics and NTEP for further treatment and care. HIV negative clients were also linked to STI centre and NTEP if required.

Table 5: HIV testing details at ICTC, ICMR-NICED (April 2021-March 2022)

Total Tested	Positive	Positivity	HIV-TB Co-Infection	Client initiated Tested	Provider Initiated Tested
417	13	3.12%	2	170	247

Total no. of HBV testing done – 170. Total no. of HCV testing done – 171. Total no. of RPR testing done – 28 (Table 6).

Table 6: HBsAg, HCV & VDRL Testing details in ICTC, ICMR-NICED (April 2021-March 2022)

Tests	HbsAg	HCV	VDRL
Total Tested	170	171	28
Total Positive	01	00	02

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

Plasma Viral Load Assay for HIV (PVL)

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.
Viral Load Testing lab of ICMR-NICED plays an important role in making decisions regarding initiation or changes in antiretroviral therapy are guided by monitoring plasma HIV RNA levels (viral load). Viral Load Testing lab of ICMR-NICED restarted HIV viral load assay for the patients under ART for monitoring effectiveness of on-going treatment as per national guidelines and to assist in HIV drug resistance mutation assay.
Participated in PT program conducted by Apex Lab, ICMR-NARI, Pune and achieved 100% concordance. Total no of sample received and tested for HIV-1 quantitative PCR during this period – 3530 (Table 7).

Table 7: Status of HIV Viral load Assay for patients under ART for the period of April 1st 2021 to March 31st 2022.

No. of Samples		HIV-1 Viral Load Copy No. <1000 copies/ml of plasma	HIV-1 Viral Load Copy No.>1000 copies/ml of plasma	HIV-1 Viral Load TARGET NOT DETECTED
Received	Tested			
3522	3530	304	298	2928

Protocol for the establishment of clinical specimen panel for WHO prequalification performance evaluation of HIV serology assays

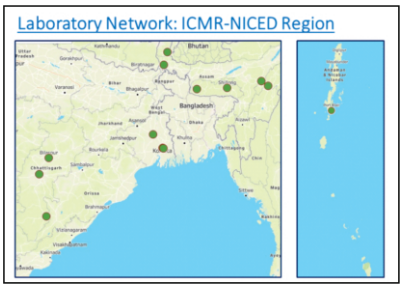
The proposal was reviewed by the investigators at ICMR-NICED. The proposal was submitted to the IEC at ICMR-NICED and has received clearance. The material transfer agreement was reviewed and sent to WHO for further action.

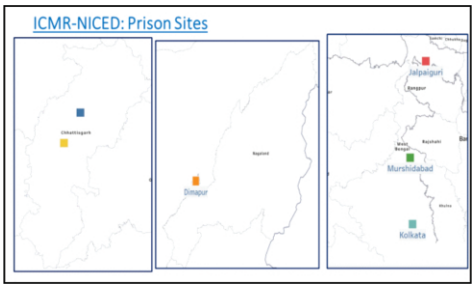
Regional Institute (East) for HIV Sentinel Surveillance

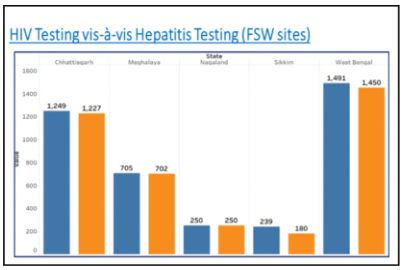
The activity of Regional Institute (East), ICMR-NICED, involves implementation of various HIV Surveillance and Epidemiological activities among Antenatal Clinic (ANC) attendees and High Risk Group (HRG) populations for the East and North Eastern states with the aims to monitor the (i) trends and prevalence 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.

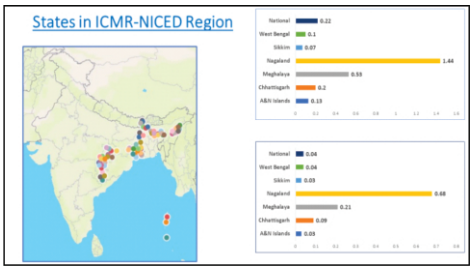
Spectrum of activities:

- Implementation and support to Surveillance and Epidemiology activities on community based integrated bio-behavioural surveillance among general population, community based integrated bio-behavioural surveillance among HRG, bridge population and PLHIV; STI surveillance, incidence surveillance, mortality surveillance, population size estimation, programme and case-based surveillance and epidemiological investigations in the states of A&N Islands, Chhattisgarh, Meghalaya, Nagaland, Sikkim & West Bengal.









- Technical support & guidance to State AIDS Control Societies (SACS) in overall planning & implementation of HIV surveillance activities in eastern & north-eastern states of India, facilitating smooth implementation of surveillance & epidemiological activities by liaisoning with the concerned state authorities and addressing specific problems at sentinel sites/ testing laboratories (Table 8, 10, 11).
- 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 surveillance round (Table 9).
- Data Entry, matching, modifying, freezing & cleaning through Strategic Information Management System.
- Concurrent data monitoring and initiation of corrective action, as and when required.
- Guide SACS in preparation of state surveillance reports after the surveillance round.
- Undertaking special epidemiological or operational studies and in-depth analyses during the inter-surveillance period to validate or strengthen surveillance findings.

Monitoring visit at Kalimpong District

- 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.
- Technical support to NACO to further strengthen the surveillance & epidemiology activities under National AIDS Control Programme.
- Support NACO in the organization of consultation/capacity building workshop on surveillance & epidemiology activity.
- Regional Institute, ICMR-NICED was given responsibility to prepare technical framework for Integrated Biological & Behavioural Surveillance (IBBS) which will be implemented during 2022-2030. IBBS will be implemented in the country among various high-risk populations like Female Sex Workers (FSW), Men who have Sex with Men (MSM), Injecting Drug Users (IDU) & Hijra/Transgender (H/TG) and bridge population (Clients of FSWs).

Monitoring visit at Alipurduar District Hospital

Table 8: ANC Sites in ICMR-NICED region for HSS Plus 2021

States	No. of Sites	Samples Allotted	No. of Testing lab
Andaman & Nicobar Islands	4	1600	1
Chhattisgarh	27	10800	3
Meghalaya	12	4800	2
Nagaland	13	5200	2
Sikkim	5	2000	1
West Bengal	25	10000	4

Table 9: 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 10: 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 11: 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

Training, Workshop and Meeting:

- A workshop on District Epidemic Profile was held on 8th July 2021 conducted by NACO & ICMR-NIMS.
- Consultation meeting on "Consolidating the Evidence, Building the Future: Integrated and Enhanced Epidemiology under NACP in India on 27th – 29th August 2021 in New Delhi.

- A workshop on District Epidemic Profile was held on 24th September 2021 conducted by NACO & ICMR-NIMS.
- Regional Post-Implementation Review Meeting for HSS Plus 2021 was held during 27th – 28th October 2021 at ICMR-NICED. Participants include HSS focal persons and SST members from Andaman & Nicobar Islands, Chhattisgarh, Meghalaya, Nagaland, Sikkim and West Bengal.

- Second National Symposium on LGBTQI+ Health was held during 9th – 11th December 2021 at New Delhi.
- Pre-Technical Working Group meeting was held during 5th -8th January 2022 on IESE fir HIV, STIs and related co-morbidities under NACP, conducted by NACO.
- Meeting on sample size calculations of newer activities under the IESE framework was held on 7th February 2022 on virtual platform.
- Meeting on Laboratory Components under the Integrated and Enhanced Surveillance & Epidemiology framework under NACP was held on 17th February 2022 on hybrid mode.
- Meeting of the Technical Working Group (S & E) was held during 7th & 8th March 2022 on virtual platform.
- National Post Surveillance Meeting was held during 22nd – 23rd March 2022 at New Delhi conducted by National Institute AIIMS.

In-Vitro Diagnostic Kit Performance Verification

As per revised notification dated 13/09/2019 from Central Drugs Standard Control Organisation (CDSCO), Directorate General of Health Services, Ministry of Health & Family Welfare (Diagnostic Division), ICMR-NICED has been included for conducting performance evaluation of the following in-vitro diagnostics on request:

- Reagents/Kits for detection of Cholera
- Reagents/Kits for detection of Typhoid
- Reagents/Kits for detection of Dengue
- Reagents/Kits for detection of Chikungunya
- Reagents/Kits for detection of Influenza

The kit evaluation committee conducted meetings in developing the administrative & technical guidelines, budget, SOPs, etc. for kit evaluation as per CDSCO guidelines. Two kits have been evaluated and four influenza ILQC has been performed generating 5.5 lakhs and 1 lakh respectively.

Virus Research and Diagnostic Laboratory (VRDL)

COVID-19 testing and reporting

Being a regional centre, Virus Research and Diagnostic Laboratory (VRDL-NICED) was one of the first 13 VRDLs in the network to get activated and initiate routine testing of SARS-CoV-2 besides NIV, Pune and NCDC, New Delhi. Currently, it is dedicated to testing samples referred directly from the hospitals and other healthcare centres/camps of Kolkata and the different districts of West Bengal. An average turnaround time of less than 24 hours is maintained for every sample received at the laboratory. Over 1.59 lakh samples have been tested during 2021-22. A BSL2+ facility was commissioned on 2020 housing the high throughput Roche COBAS 8800 at ICMR-NICED to keep up with increasing testing demands in West Bengal. The system was utilized for timely testing utilizing minimum manpower and uploading of results in ICMR portal along with quick communication to the referring centres, maintaining minimum turnaround time.

COVID-19 inter laboratory quality control (ILQC)

VRDL-NICED is a part of the ICMR network of quality control labs performing ILQC for maintenance of the testing standards of SARS-CoV-2 RT-PCR to the highest level possible for the established labs of West Bengal and Sikkim. It is one of the 33 State QC labs performing the periodic ILQC for the labs under it. The State QC labs have been mapped to the National QC Lab at NIV, Pune for QC activity. NIV, Pune participates in a Global QC activity of WHO. A total of 75 government and private testing labs of West Bengal and Sikkim have been mapped under VRDL-NICED. Two rounds of biannual QC activity have been completed. QC samples numbering 1500 have been evaluated and submitted in the ILQC portal. One round of ILQC have been performed with NIV, Pune and achieved 100% concordance in each round.

COVID-19 kit validation

ICMR-NICED performs validation and batch testing of COVID-19 diagnostic kits and RNA extraction kits. The kit validation program has ensured a steady supply of high-quality kits from different manufacturers. A total of 25 kits have been validated and 16 kits were batch tested maintaining turnaround time.

Table 12: Diagnostic services of Regional VRDL (other than COVID-19)

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
Zika	Zika viral RNA	Real Time 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

COVID-19 Biorepository:
COVID-19 Biorepository at ICMR-NICED was a part of the network of ICMR biorepositories for COVID-19 across India with a mandate for collecting, storing, and maintaining clinical samples of COVID-19 cases. A total 1438 swabs, 519 plasma, 493 serum, 162 stool, 245 urine, 93 sputum samples from 348 total participants (345- cross-sectional and 3- follow-up participants) were collected and preserved in aliquots in collaboration with B.R. Singh Hospital, Calcutta

Medical Research Institute, and Salt Lake AMRI Hospital. Such samples will be used to develop validated diagnostics, therapeutics, vaccines etc. Additionally, the samples will be a valuable resource for research & development activities to understand the early predictors of disease severity, immunopathogenesis of the disease etc.

National Repository of Antimicrobial Resistant Bacteria (NRAMRB): a facility under the "AMR Hub" for addressing AMR research across India

The sanction letter and fund from ICMR HQ was received in August 2021. Biosafety clearance was received from IBSC. Five project staffs (Project Scientist B, Laboratory Technician, MTS and DEO) were recruited, and they joined in November 2021. The specification of the equipment has been finalized and NICED store is currently processing the procurement through tendering. Procurement of the NGS (Ion GeneStudio S5) through the Procurement Cell at ICMR Headquarter has been completed and is being installed at the laboratory. Renovation of part of the NRAMRB laboratory is currently going on. The procurement of reagents, consumables and primers for molecular biology related work have been done. MOA had been prepared, finalized after discussion with the investigators and sent to Dr. Kamini Walia (ICMR-Headquarter) for approval. Preparation of SOP for NRAMRB laboratory is going on. Portal development for NRAMRB is currently under construction. Datasheets had been prepared for different isolates which were received from designated nodal centres across the nation during the pilot project - *Pseudomonas aeruginosa* (100 isolates), *Acinetobacter baumannii* (50 isolates), Non typhoidal Salmonellae (50 isolates), *Shigella spp.* (50 isolates) – received from CMC Vellore; *Salmonella* Typhi (23 isolates), *Salmonella* Paratyphi A (14 isolates), *Salmonella* Typhimurium (11 isolates), *Salmonella Enteritidis* (2 isolates) – received from AIIMS Delhi; *Staphylococcus aureus* (51 isolates), Enterococcus spp. (55 isolates), Coagulase negative Staphylococcus (CONS) (50 isolates) – received from JIPMER Puducherry; *Escherichia coli* (17 isolates), *Klebsiella pneumoniae* (14 isolates) – received from PGIMER Chandigarh. Randomly selected Gram-negative (30) and Gram-positive isolates (30) were further cross-checked for identification by biochemical methods. The polymerase chain reaction was performed to amplify the target gene sequence in E. coli. Different antibiotic resistant genes including β-lactamase genes ($bla_{SHV,\ TEM,\ OXA\text{-}1,\ CTX\text{-}M}$ etc), carbapenem-resistant genes ($bla_{KPC,\ IMP,\ VIM,\ NDM,\ OXA48,\ SPM}$), plasmid mediated AmpC β-lactamases ($bla_{MOX,\ CIT,\ DHA,\ ACC,\ MIR/ACT,\ FOX}$), 16S rRNA methylase genes (*rmtA, rmtB, rmtC, rmtD, rmtE, rmtF, rmtG, armA*) and fluoroquinolone resistance genes *(qnrA, qnrB, qnrS, oqxAB and aac(6')-Ib/Ib-cr*) were amplified by PCR.

Influenza Diagnostics:

Globally, community-acquired pneumonia (CAP) is one of the principal causes of mortality among the elderly population, and viral pathogens like influenza virus and respiratory syncytial virus (RSV) are common causes of pneumonia in the older age group. Significant morbidity, hospital admissions, and a declining rate of quality of life are consequences of this disease. To estimate the burden of Acute Respiratory Infection (ARI) and associated Influenza virus (Influenza A and B) and Respiratory syncytial virus (RSV) infections in terms of incidence at community level, outpatient clinic visits, hospitalization and mortality among the elderly (≥ 60 years) population, Indian Network of

population-based Surveillance Platforms for Influenza and other Respiratory viruses among Elderly (INSPIRE), a multi-centric projectwas formulated.

Community and hospital based surveillance was conducted for assessment of Influenza A and B virus in Acute Upper Respiratory Infection (AURI) and Acute Lower Respiratory Infection (ALRI). A total of six hundred sixty-six (666) samples were collected from April 2021 to March 2022. Based on the clinical status groups samples were classified into acute upper respiratory tract infection (AURI); acute lower respiratory tract infection (ALRI); corona like illness (CLI); AURI with the CLI, and ALRI with the CLI and the number of samples within the group were 108, 9, 95, 402 and 52 respectively. Primarily, all the samples were tested to detect the Influenza A, B and RSV viruses, followed by subtyping of the influenza A and B samples. In addition, a total of 549 CLI-associated samples were tested for SARS-CoV-2 infection. Out of 666 samples, only 10 samples were found positive for InfA/pdm09 H1N1, 22 samples were found positive for InfA/H3N2 virus and 9 samples found positive for InfB/Victoria subtypes. Whereas, 76 out of 549 CLI-associated samples were found positive for SARS-CoV2 infection. All the specimens were tested using real-time reverse transcriptase PCR (RT-PCR) for detection, typing, subtyping, and lineage of influenza viruses (A (H1N1) pdm09, A (H3N2), B (Victoria), and B (Yamagata) viruses). Results indicate less prevalence of influenza in COVID pandemic situation.

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. Being 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.

During this year of report we have received a total of 170 samples from different cholera endemic regions and hospitals in India for characterization and phage typing analysis. Strains received were confirmed as *V. cholerae* O1 biotype ElTor. Serological identification was carried out with each of the strain by using polyvalent O1 and consequently monospecific Inaba and Ogawa antisera. All the strains were characterized by phage typing using a panel of typing phages available with us at the Vibrio Phage Reference Laboratory. Phage typing was performed using the sets of typing phages available with us using the conventional phage typing scheme of Basu and Mukherjee and New phage typing scheme developed at NICED. Most of the strains received were identified as *V. cholerae* O1 biotype ElTor, Ogawa. Strains were discriminated into two different types using the conventional phage typing scheme of Basu and Mukherjee. However, new phage typing scheme discriminated the strains into six different types. The phage type 27 was found as the predominant type followed by type 25.

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. Currently this facility is working actively and I am working as laboratory Supervisor in this facility with the responsibility to look after the laboratory activities of GTPR.

This laboratory received strains for characterization and related consent for storage of strain from different laboratories who have sent strain for diagnostic or characterization purposes at ICMR-NICED. Strains are being stored following the standard protocols and storage of new strains is ongoing. Diagnostic test results received from the Microbiology division were communicated to the concerned sender of the strains by this facility.

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.

Isolation of SARS-CoV-2 virus
To perform research on SARS-CoV-2, isolation of virus from the clinical samples of COVID-19 patients is an important approach to work on the biology of SARS-CoV-2.

ICMR-NICED is equipped with a BSL-3 facility. It was planned to isolate SARS-CoV-2 virus from the patient's samples in BSL-3 facility following the proper guidelines.

Vero E6 cell line was procured from NCCS (National Centre of Cell Science), Pune and cultured in Dulbecco's Modified Eagle Medium (DMEM, GIBCO, USA) (containing high glucose, L-glutamine, pyruvate) with 10% FBS (Sigma, US origin), 100nm P/S, in 5% CO2 at 37oC.COVID-19 positive patient's samples (Nasopharyngel swab) were received from Virus Research and Diagnostic Laboratory (VRDL) of ICMR-National Institute of Cholera and Enteric Diseases and SARS-CoV-2 virus was isolated in a BSL-3 laboratory following standard methodologies. Ten samples with low ct value (ct value <20) were used to infect Vero E6 cell lines.Virus infection was confirmed after the sixth passage by RT-PCR of S gene and virus titre was measured by plaque assay. The experiments were done in triplicate and all the experiments with live virus were performed in BSL-3 facility following the guidelines of WHO.Total 6 viruses were isolated

SARS-CoV2 Kit Validation:
Virology Division, ICMR NICED was one of the designated validation center for SARS-CoV2 kits . ICMR-NICED has validated >25 RNA and RT PCR kits. Majority of the kits were "Make in India" kits. In addition, the center performed batch testing of RNA and RT PCR kits which were distributed through ICMR depots.

CRISPER based diagnosis of Covid-I9 using paper microfluidics:
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.The objectives of the current year was Real-Time RT-PCR analysis of viral gene target and development of RT-LAMP assay with cross validations to develop a CRISPR-CAS system for COVID-19 diagnosis.

Full length RNase P, M gene and N gene of SARS-CoV-2were cloned in pCDNA6B vector.Guide RNA sets for *Cas12a CRISPR* enzyme for M gene, RNase P gene, N gene was prepared with our designed primers and cloned in pCDNA6B vector. RT-LAMP detection primers were designed and checked for cloned M and RNaseP gene and a Gel electrophoresis mediated detection was achieved.

Establishment of Ten ICMR- biorepositories for COVID-19 in India.
Currently, there is no existing structured procedure for collecting and storing of valuable clinical samples isolated from COVID-19 patients. 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 COVID19 patients which will be useful for development and validation of new diagnostics, therapeutics or vaccines. Therefore, access to different kinds of clinical samples from infected patients is an essential requirement to be used in validating newly developed diagnostics, therapeutics, vaccines etc.

As a designated centre, ICMR-National Institute of Cholera & Enteric Diseases, has collected and stored the Nasopharyngeal & Oropharyngeal swabs, Serum, Plasma, Stool, Urine, Sputum and Bronchioalveolar Lavage from confirmed Covid-19 positive patients after obtaining the consent of patients or their respective family members. The bio specimens were collected during the acute phase of illness (COVID-19) across the district hospitals (Kolkata) as per biosafety and biosecurity guidelines of ICMR or WHO.The COVID-19 biorepository at ICMR-NICED collected the samples as well as donor information including COVID-19 testing reports, the pathological findings and the methods used in hospital diagnosis. The samples were stored at -80°C and -20°C temperature with appropriate labelling.

We have preserved a total number of 1438 Swab, 519 Plasma, 493 Serum, 162 Stool, and 245 Urine, 93 Sputum samples from 348 total participants (345- Cross Sectional and 3- Follow up participants) and preserved the aliquots of different samples as per the guideline mentioned in the respective SOPs.We have stored all of the samples as mentioned above in our repository.

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 in charge 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

The activities of ICMR-NICED under the Swachhta Action Plan during the period April 2021 to March 2022 included Swachhta Awareness Campaign among the slum dwellers and owners and consumers of several roadside eateries, public seminars as well as observation of special programmes as directed by the concerned ministry. 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. A brief account of the activities is mentioned below.

Swachhta Programmes in the Communities:

ICMR-NICED organized several community-based programmes to promote Swachhta-related awareness and practices among the community members. 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 surrounding clean and garbage free and encouraged the community members to undertake voluntary cleanliness drives within their localities. They also visited several roadside eateries to convey food, hand and personal hygiene related matters. 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.

Table 13: Swach Bharat Programs in Various Populations, 2021-'22

DATE	VENUE	PARTICIPANTS
09-04-2021	Two road side eateries around ID & BG Hospital, Kolkata	Shop owners and customers
19-07-2021	Food joint near Subhas Sarobar, Kolkata	Food handlers, customers and the shop owners
13-08-2021	Awareness campaign in a Community Hall within a slum area in Ward No. 59, Beliaghata	Around 30 women slum dwellers and 5 children
20-09-2021	Slum area at 100, Suren Sarkar Road, Beliaghata	15 local residents as well as 6 children
27-12-2021	Slum area of KMC Ward No. 33 located at 6, Radha Madhab Garden Lane	18 local residents as well as 4 children
28-01-2022	Slum area of 95/H/2 Beliaghata Main Road, Kolkata	22 adult slum dwellers (both male and female)
28-02-2022	Slum area at 37, Suren Sarkar Road, Kolkata-700 010	20 adult slum dwellers (both male and female)
25-03-2022	Awareness campaign among the slum dwellers and some street-side tea shop owners at Suren Sarkar Road, near Subhas Sarobar Park	Slum dwellers; shop owners and customers of tea shops

Special Swachhta Drives by ICMR-NICED:

(a) A special cleaning activity at NICED-I building premises was conducted on April 05, 2021. Around 50 staff members of the institute including scientists, technical, and administrative staff participated in the event under the guidance and active participation of the Director, ICMR-NICED.

(b) Voluntary Cleaning Activity in the Community:
A four-member team of the Health and Hygiene Committee of ICMR-NICED organized a voluntary cleaning activity around Subhas Sarabor Park, Beliaghata, Kolkata on April 13, 2021. The members picked up garbage and other waste materials lying on the road side and near the entrance of the park. The collected materials were disposed safely in garbage disposal box, to keep the area clean and healthy. They also distributed face masks among passer byes and urged not to throw garbage and litters around the park.

(c) A special cleanliness drive was organized on the occasion of birth day of Mahatma Gandhi on October 02, 2021 at NICED-I building premises.

Community program
under Swachh Bharat Campaign

Community program
under Swachh Bharat Campaign

Swachh Bharat Campaign
in a tea shop

Swachh Bharat Campaign
on World ORS Day 2021

Observation of statutory DAYS

(a) Celebration of World Health Day, 2021:
ICMR-NICED organized a popular lecture on the occasion of World Health Day, 2021 within the Institute on 7th April, 2021. The event was attended and thoroughly enjoyed by the scientists, staff and students of ICMR-NICED. The theme of World Health Day, 2021 was "Building a Fairer, Healthier World". The guest lecturer of the programme Dr. Atreyi Chakrabarti, Deputy CMOH-II, South 24-Parganas district spoke in detail about various facets of Universal Health Coverage including different government health programmes and initiatives and implications of them. Through her lecture she also elaborated on the relationships among "COVID-19 prevention and treatment", "Swachhta" and "access to health care".

(b) Observation of World ORS Day, 2021:
ICMR-NICED observed World ORS Day on 29th July 2021. On this occasion, a Community Awareness Program was carried out by the Scientists and other staff of ICMR-NICED at a community clinic located in Ward 58 of Kolkata Municipal Corporation. Maintaining COVID protocol, neighbouring community members - mostly women, were made aware about hand washing, hygiene, sanitation, use of nutritious foods and preparation of ORS in order to prevent diarrhoeal disease and dehydration. Following this, ORS packets, IEC materials and hygiene kits were distributed to the community members.

Dr. Sujit Kumar Bhattacharya, former ADG, ICMR & former Director, ICMR-NICED delivered an invited virtual lecture on "Evolution and history of ORS research and advocacy globally: role of ICMR-NICED", where he shared his rich experience in diarrhoeal disease and ORS research in attaining the glory of ICMR-NICED. All the scientific, administrative, technical and project staff as well as the students participated in the programme.

Popular Lecture on Environmental Cleanliness and Health

A popular lecture was organized on April 15, 2021 for the scientists, staff and students of ICMR-NICED. Dr. Somnath Hazra, Consulting Economist and Visiting Faculty, School of Oceanographic Studies, Jadavpur University, Kolkata was invited to deliver a talk on "Clean India Mission: A step towards Social responsibility and environmental protection".

OUTBREAK INVESTIGATIONS

The Nationwide COVID-19 Serosurvey - Round 4 was carried out in June 2021. ICMR-NICED, with active cooperation from the State and respective District Health Authorities, successfully conducted this survey in eight districts / health districts in West Bengal – namely, South 24-Parganas, Diamond Harbour HD, Bankura, Bishnupur HD, Jhargram, Alipurduar, Purba Medinipur, Nandigram HD. In each district, 10 clusters (villages / municipal wards) were selected and from each cluster a minimum of 40 individuals aged 6 years or more were included in this survey from the general population. Thus, the minimum sample size per district for the general population was 400; in addition, 100 health care workers were also included from 1 or 2 selected health care facilities. In this survey, the study teams visited the selected households and after obtaining informed consent, captured relevant information on an Open Data Kit (ODK) application on mobile phones. Trained phlebotomists in each survey team collected about 3 ml of venous blood from each participant. The serum was separated after centrifugation in a local health facility and later transported to the ICMR-NIE laboratory in Chennai. All serum samples were tested for presence of IgG antibodies against SARS-CoV-2. Overall about 60% of the general population and 80% of the health care workers found to have antibodies against SARS-CoV-2.

Information collection during COVID-19 serosurvey (round 4)

Specimen collection during COVID-19 serosurvey (round 4)

Specimen collection during COVID-19 serosurvey (round 4)

Specimen processing during COVID-19 serosurvey (round 4)

In view of rapid surge in cases and deaths because of COVID 19, deployment of Central Multi-disciplinary team was done to 10 identified states including West Bengal. The team conducted their activities for a period of five days from 27/12/2021- 30/12/2021

Assist the state of West Bengal in management of COVID-19 pandemic and worked in several districts of West Bengal to understand the situation of SARS-CoV-2 infection. To assist the state in controlling COVID-19 outbreak we visited municipal areas and blocks to access the COVID- 19 situation in Kolkata, North 42 Parganas, South 24 Parganas, Hooghly and Howrah district of West Bengal. We also visited COVID 19 hospitals, district hospitals, PHCs and diagnostic centres at Kolkata, North 42 Parganas, South 24 Parganas, Medinipur and Howrah to provide necessary support to the state. Airport preparedness was access by the team at NSC Bose Airport, Kolkata.

Areas focussed during field visit was

- Testing : RAT/RTPCR
- Contact tracing, including surveillance, containment operations
- Samples for Genome sequencing to INSACOG network
- COVID appropriate behaviour and its enforcement
- Hospital logistics: Number of beds, ambulances, Medical O_2 etc.
- COVID-19 Vaccination progress

This visit was important to provide necessary suggestion for better implementation of containment plans and micro plans including better hospital management.

TRAINING & EXTENSION

A. Important Meetings held at ICMR-NICED

The Scientific Advisory Committee (SAC) of ICMR-NICED 2021: The 49th Scientific Advisory Committee (SAC) meeting of ICMR-NICED virtually held on 28-29 September, 2021 in presence of Director, SAC Experts and Scientists of NICED

B. Visit of Scientists / Scientific Staff /Academicians

Lecture/ session Title	Date	Invited scientists/ Academicians
Adverse Drug Reactions & Pharmacovigilance	21.09.2021	Dr Ananya Mondal, MD, Associate Professor, Pharmacology (NRS Medical College)
Pharmacovigilance: what does it mean to the consumers	21.09.2022	Prof. Santanu Munshi, MD, DM, Head of the Dept, STM, Kolkata
An overview of Adverse Events to COVID 19 vaccination and the reporting status in global drug safety database (VIRTUAL)	22.09.2021	Prof. Suparna Chatterjee, Eastern Regional Coordinator of Pharmacovigilance & HOD, Pharmacology, IPGMER, Kolkata
"How existing public health system can be leveraged upon implementation on Antimicrobial Stewardship Program (AMSP) at peripheral health tiers"	18.11.2021	1. Dr. Dipankar Maji, DDHS(PH) & SSO, IDSP, Govt of WB 2. Prof (Dr) Munmun Das Sarkar, OSD – COVID and Professor, Microbiology, CNMCH / Directorate of Medical Education, Govt of WB 3. Prof (Dr.) Kalpana Datta Professor, Pediatric Medicine Medical College & Hospital, Kolkata 4. Dr. Bhaskar Narayan Chaudhuri Consultant Clinical Microbiologist and Infection Control Officer Peerless Hospital, Kolkata Moderator : Dr. Sandip Mukhopadhyay , Scientist E, ICMR- NICED
"Genomics of SARS COV2" - Oration on Foundation day	18.02.2022	Dr. Saumitra Das, Ex-Director, NIBMG, Kalyani
Newer management policies of Type II Diabetes and Diabetes reversal	28.02.2022	Dr Rana Bhattacharya, MD, DM, MRCP, Associate Professor, Endocrinology, IPGMER

Pathogens and indicators in foods (Virtual)	2803.2022	Prof. Iddya Karunasagar Advisor (Research and Patents), Nitte University, Mangalore
Foodborne pathogens and their prevention strategies	30.03.2022	Dr. Sanu Jacob, Director (Science and Standard), FSSAI
Empowerment of women in the world of special needs	8.03.2022	Dr. Aditi Bandyopadhyay, MBBS (Cal), MD (WBUHS), Medical Faculty, Department of Physiology, IPGMER & SSKM Hospital, Kolkata

C. Training/ Workshop/ Conferences held atICMR-NICED

Sensitization program on Pharmacovigilance : ICMR-NICED has successfully conducted 'Two days' sensitization program on Pharmacovigilance in a hybrid mode (physical + virtual) on the 21 and 22nd September, 2021. The program stated with inauguration by 'Digital lamp lighting' followed by 'welcome address' by Dr. Shanta Dutta, Director, ICMR-NICED. The program included Symposium, Panel discussion, Expert lecture and Hands on workshop. Scientists of ICMR-NICED, doctors and nurses of nearby hospitals attended the program physically with full enthusiasm and with an oath to spread it further. Many other participated virtually from all over India. Faculty from Medical Colleges acted as resource person in the program.

The 3rd Training Workshop on Biosafety and Biosecurity was organized by Regional VRDL, ICMR-NICED, on 26th October 2021. Dr. Shanta Dutta, Scientist G and Director of ICMR-NICED, welcomed the participants and distinguished faculty and emphasized the importance of such kind of workshop especially in COVID-19 pandemic situation. The program included lecture sessions on Biosafety and Biosecurity, Emergency responses in the Laboratory, Emerging and Re-emerging high risk pathogens, Role of Containment Laboratories, Biomedical Waste management guidelines, and Fire Safety and hands-on demonstration of Hand washing, PPE donning and doffing, spill management and triple layer packaging. A total of 57 participants including 6 lab personnel from STNM, Gangtok and 7 faculty/resource person attended the training physically while the students and other staff of the institute attended virtually.



Regional post surveillance review meeting on HIV Sentinel Surveillance (HSS) Plus-2021 was held during 27-28th October, 2021 at ICMR-NICED in hybrid mode. This meeting was organized by Regional Institute (East) for HSS,

ICMR-NICED for the states of A & N Islands, Chhattisgarh, Meghalaya, Nagaland, Sikkim and West Bengal. Director & other Scientists of ICMR-NICED, Project Directors, HSS Focal persons, M&E Officers and State Epidemiologists from SACS, officials from Technical Support Units, Laboratory In-charges/Technical Officers from designated HSS testing labs, SST members, RI Officials and Program Officer from NACO participated in the meeting.



A Panel discussion entitled "How existing pubslic health system can be leveraged upon implementation on Antimicrobial Stewardship Program (AMSP) at peripheral health tiers" (Part of the Antimicrobial Resistance Week) was held on 18 November, 2021 at NICED II Seminar Room.

A Webinar was organized on 23rd November, 2021 at ICMR-NICED on "Rising AMR burden; multi-sectoral efforts in India". Following welcome address by the Director, ICMR-NICED, the speakers, Dr. Kamini Walia, Scientist-F, Program Officer, AMR, ICMR, New Delhi, Dr. Rajeshwari Sinha, Programme Manager Food Safety and Toxins Programme Centre for Science and Environment, New Delhi and Dr. Arti Kapil, Professor, Department of Microbiology, All India Institute of Medical Sciences, New Delhi presented on various aspects of AMR. The program ended with vote of thanks from Dr. S. Basu, Scientist-F, ICMR-NICED. All the scientific, administrative, technical & project staff, students participated in the programme and made the event successful.




Hand-on laboratory training workshop on Foodborne Pathogen: ICMR-NICED conducted a "Hand-on laboratory training workshop on Foodborne Pathogen Survey in North East India" from March 28 to 30, 2022. Director General of ICMR released the SOP for the isolation and identification and AMR testing of foodborne pathogens on the first day of the training program. Participants from the Northeast regions attended the training program and made this event successful.



Events

Observation of Swachhata Pakhwara: ICMR–NICED observed the #SwachhataPahkwara from 1-15 April 2021. Under the above program, cleaning activities within the premises of ICMR-NICED was performed under the leadership of Dr. Shanta Dutta, Director, ICMR-NICED. All the scientists, administrative, technical and other project staff participated in the activity with good enthusiasm.

ICMR-NICED celebrated National Doctors Day on 1st July 2021. The program was initiated with maintaining two minutes silence commemorating all those Doctors and Health Care Workers who left us battling COVID-19 Pandemic. Dr. Raja Dhar, eminent Pulmonologist, Director & HOD, CKB Group of Hospitals, Kolkata delivered a virtual lecture on "COVID-19 : Changing Scenario" followed by interactive sessions with the audience. All the scientific, administrative, technical & project staff, students participated in the programme and made it successful.

World ORS Day at ICMR-NICED on 29th July 2021:Community Awareness program was carried out by the Scientists and other staff of ICMR-NICED at community clinic located at Ward 58 of KMC. Neighbouring community member mostly women, maintaining COVID protocol, were made aware about hand washing, hygiene, sanitation, use of nutritious foods and preparation of ORS in order to prevent diarrhoeal disease and dehydration. Following awareness lecture by staff of NICED, ORS packets, IEC materials and hygiene kits were distributed to the community members.

Invited lecture was initiated with the inaugural address by Dr. Shanta Dutta, Director ICMR- NICED. Dr. Sujit Kumar Bhattacharya, Former ADG, ICMR & Former Director, ICMR-NICED delivered his virtual lecture on "Evolution and history of ORS research and advocacy globally: role of ICMR-NICED" where he shared his rich experience in diarrhoeal disease and ORS research in attaining the glory of ICMR- NICED. All the scientific, administrative, technical & project staff, students participated in the programme and made it successful.

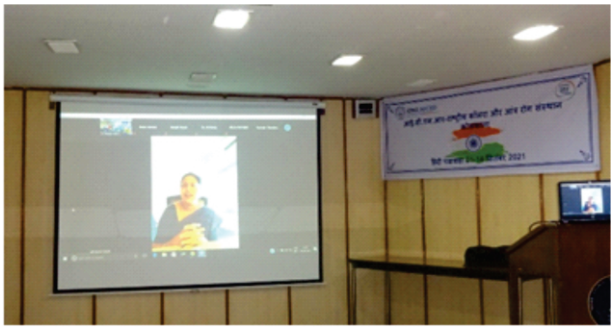
Celebration of 75th Independence Day of India at ICMR-NICED, Kolkata. Director, Staff and some of their family members participated in the flag hoisting ceremony at 11.00 a.m. on 15th August, 2021 at the premises of NICED-1 building. National Anthem was sung by the staff at the end of the program.

ICMR-NICED organized "Fit India Freedom Run 2.0" to commemorate "Azadi Ka Amrit Mahotsav" under Fit India Movement on 25th August 2021. The Director along with the scientific, administrative, technical, project staff and research fellows participated in the Run to make the event successful.

आई.सी.एम.आर राष्ट्रीय कॉलरा और आंत्ररोग संस्थान, कोलकाता में 1 सितंबर से 14 सितंबर 2021 तक हिंदी पखवाड़ा मनाया जा रहा हे। हिन्दी पखवाड़ा के अवसर पर आज ३ सितंबर, 2021 को निदेशक महोदया डॉ शांता दत्ता की उपस्थिति में हिन्दी कार्यशाला का आयोजन किया गया। श्री नवीन कुमार प्रजापति, वरिष्ठ सलाहकार, केंद्रीय अनुवाद ब्यूरो, राजभाषा विभाग, नेतृत्व (क्रैश) अनुवाद प्रशिक्षण कार्यक्रम के तहत ''राजभाषा नीति में अनुवाद का महत्व और अभिप्रेरणा'' विषय पर कार्यशाला करवाया। इ, कार्यशाला में संस्थान के वैज्ञानिकों अधिकारियों एवं कर्मचारियों ने भाग लिया।

हिन्दी पखवाड़ा 2021 के उपलक्ष में आई.सी.एम.आर राष्ट्रीय कॉलरा और आंत्ररोग संस्थान में 7 सितंबर, 2021 को निबंध लेखन प्रतियोगिता और आशु भाषण प्रतियोगिता आयोजन की गई। दोनों प्रतियोगिता में कार्यालय के अधिकारियो एवं कर्मचारियो ने सकारात्मक रूप से भाग लिया। निर्णायक के तौर पर केंद्रीय हिन्दी शिक्षण योजना, राजभाषा विभाग की हिन्दी प्रध्यापक श्रीमती श्रुति मिश्रा और संस्थान की वैज्ञानिक श्रीमती पल्लवी इंदवार उपस्थित थीं। हिन्दी समिति के नेतृत्व में कार्यक्रम सफल रहा।

हिन्दी पखवाड़ा के अवसर पर आई.सी.एम.आर राष्ट्रीय कॉलरा और आंत्ररोग संस्थान में 9 सितंबर 2021 को वैबिनार का आयोजन किया गया। वैबिनार में एकल अतिथि वक्ता के तौर पर श्री शिक्षायतन कॉलेज, हिन्दी विभाग से प्रो. आल्पना नायक नें ''आजादी के 75 साल और भारतीय भाषाओं की भूमिका'' विषय पर अपने विचार प्रस्तुत किए। वेबिनार में संस्थान के कई अधिकारी और कर्मचारी उपस्थित थे। हिन्दी समिति के नेतृत्व में कार्यक्रम सफलता पूर्वक सम्पन्न हुआ।



आई.सी.एम.आर राष्ट्रीय कॉलरा और आंत्ररोग संस्थान में 14 सितंबर 2021 तक हिंदी दिवस के उपलक्ष्य में हिन्दी पखवाड़ा का समापन समारोह का आयोजन किया गया। इस अवसर पर संस्थान के निर्देशक डॉ. शांता दत्ता की उपस्थिति में निबंध लेखन प्रतियोगिता और आशु भाषण प्रतियोगिता के प्रतिभागियो को प्रमाण–पत्र के साथ पुरस्कार वितरित किया गया। साथ की संस्थान के शेधार्थियो द्वारा सांस्कृतिक कार्यक्रम के अंतर्गत नाटक, नृत्य, संगीत एवं काव्य आवृत्ति की प्रस्तुति की गई। कार्यालय के वैज्ञानिक–गण, अधिकारी और कर्मचारियों की सकारात्मक उपस्थिति ने कार्यक्रम को सार्थक एवं सफल बनाया।



Swachh Bharat Campaign: To commemorate the birth anniversary of Mahatma Gandhi, ICMR-NICED observed special drive on the #SwachBharatCampaign in the month of October 2021. Under the above program, one cleaning activities within the premises of ICMR-NICED was performed on 2nd October, 2021 under the leadership of Dr. Shanta Dutta, Director, ICMR-NICED. All the scientists, administrative, technical and other project staff and students participated in the Swachh Abhiyan activity with good enthusiasm. Members of Swachh Bharat committee also conducted a Swachhta Awareness Campaign at one road-side food stall near ICMR-NICED.



Observation of Vigilance Awareness Week: ICMR-NICED observed #VigilanceAwarenessWeek (26 October to 1st November 2021) through a Pledge Ceremony on 26th October 2021. Vigilance and Integrity pledge was taken in Hindi, English and Bengali by all scientific, technical and ministerial staff, under the leadership of Dr. Shanta Dutta, Director, ICMR- NICED. Next a lecture competition on this year`s theme "Independent India @75: Self Reliance with Integrity" was organized where many staff of ICMR-NICED actively participated and made the event successful. Banners containing the theme of the Vigilance Awareness Week 2021 in Hindi and English were displayed in all buildings of ICMR-NICED. A vigilance awareness flyer was designed, distributed and displayed in ICMR-NICED website.



Observation of National Unity Day: ICMR- NICED observed #NationalUnityDay (31st October 2021) through a Pledge Ceremony on 29th October 2021. National Unity pledge was taken in Hindi, English and Bengali by all scientific, technical and ministerial staff, under the leadership of Dr. Shanta Dutta, Director, ICMR- NICED. Banners of National Unity Day in Hindi and English were displayed in all buildings of ICMR-NICED.

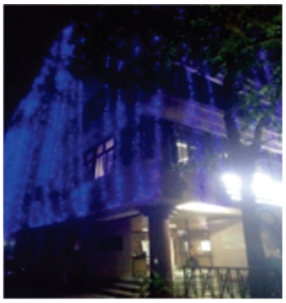
Observation of Communal Harmony Campaign Week & Flag Day: ICMR-NICED observed Communal Harmony Campaign Week & Flag Day (19th to 25th November, 2021). In this occasion a seminar on Communal Harmony Campaign was organized at ICMR-NICED on 22nd November 2021. Mr. Amit Kumar Dixit, Assistant Director, Central Ayurveda Research Institute, Ministry of AYUSH, Govt. of India, delivered a lecture on the importance of communal harmony and national integration. After the talk, there was a program of patriotic songs by staff of ICMR-NICED. The program ended with singing of National Anthem. All Scientists, technical, administrative, project staff and students participated to make the event successful.



Observation of World Antimicrobial Awareness Week: ICMR-NICED observed World Antimicrobial Awareness Week (18-24 November, 2021). A community outreach program to enhance awareness on appropriate antibiotic consumption of the community was conducted by staff of ICMR-NICED in Ward 58 of KMC on 23rd November 2021. IEC materials prepared by ICMR-NICED and hygiene kits were distributed among the community participants and they were sensitized on appropriate antibiotic use.In this occasion, all the three NICED buildings were illuminated in light blue on Wednesday, 24 November 2021 to mark the close of World Antimicrobial Awareness Week as advised by WHO Country Office. Light blue colour and the WAAW stamp were also used in social media profiles to spread AMR awareness.





Observation of Constitution Day by reading of the Preamble by the staff of ICMR-NICED on 26/11/2021 at 11.00 am on the occasion of Constitution Day


India International Science Festival: One outreach programme under the banner of India International Science Festival (IISF) 2021 was arranged by ICMR-NICED on November 27, 2021 at 11:30 AM at urban slum community of Kolkata. The programme was attended by about 40 local residents, which included students and their parents. The Director, ICMR-NICED addressed the mass on the benefit of COVID-19 vaccination to fight against the disease. She also mentioned India's endeavor on vaccine development and deployment with special reference to COVAXIN (collaborative vaccine of ICMR, ICMR-NIV and Bharat Biotech). ICMR-NICED Sr. Scientists interacted with the participants to respond to their queries. All these activities belong to Azadi Ka Amrit Mahotsav. Kits containing facemask, hand sanitizer and soap were distributed among all attendees. Whole program was conducted following appropriate COVID-19 protocol.

World AIDS Day was observed on 1st December 2021 at ICMR-NICED, Kolkata. In accordance with this year's theme, ICMR-NICED organized a program with special focus to remove the inequality, to end AIDS and to end Pandemics. Dr. Shanta Dutta, Director, ICMR-NICED inaugurated the program with her welcome address. Guest speakers of the program included, Dr. Santosh Giri, the Director, Kolkata Rista, a transgender community-based organization working for gender and sexual minority (LGBTH) communities; Ms Rina Gayen, Community Care Coordinator, ART Centre of SSKM Hospital, Kolkata and Ms. Joyita Mondal, India's first transgender judge of a Lok Adalat in Islampur, West Bengal who shared their personal experiences during their fight against the disease. The program ended with Vote of Thanks by AO, NICED. Scientists, technical, administrative, project staff and students participated in the program to make the event successful. A community outreach program was also carried out in collaboration with 'Kolkata Rista" to enhance awareness the in community.

Observation of 73rd Republic Day of India at ICMR-NICED, Kolkata. Director, Staff and their family members participated in the flag hoisting ceremony at 11.00 a.m. on 26th January 2022 at the premises of NICED-1 building. Following inaugural address by Dr. Shanta Dutta, Director, ICMR-NICED, few other staff expressed their views on the importance of the Republic Day in our day to day scenario. National Anthem was sung by the staff at the end of the program.

The 60th Foundation Day celebration of ICMR-NICED on 18/02/2022. Following inaugural song by staff & students, Dr. Shanta Dutta, Director, ICMR-NICED, in her welcome address mentioned the glorious journey and evolution of this Institute over the years. Dr. Samiran Panda, Addl. DG and Head, ECD, ICMR delivered the inaugural speech as 'Guest of Honour' and encouraged the scientists to venture more into translational and public health related research. Next lighting of lamp and release of NICED Publications (2005-2020) took place.
Prof. (Dr.) Saumitra Das, Department of Microbiology & Cell Biology, IISc, Bangalore, and Ex-Director, NIBMG, Kalyani, West Bengal, an internationally acclaimed scientist delivered the ICMR-NICED Foundation Day Oration 2022 on "Genomics of SARS-CoV-2".

Mementos were distributed to the employees completing 25 years' Service and Prizes were given to Best Cleaning/ Housekeeping staff under Swachh Bharat initiative. The program ended with Cultural Program by Staff and Students followed by National Anthem. All scientist, regular and project staff, pensioners and students participated in the ceremony to make the event successful



Walk for NICED: NICED employees and students participated in the 'Walk for NICED' which was organized at 5.00 pm on 18/02/2022 from NICED-1 old building to Beliaghata CIT More and back to NICED-1 building.

Speech competition: On the occasion of the 60th Foundation Day of NICED and celebrating Azaadi Ka Amrut Mahotsav, one speech competition was organized for the Research Scholars at NICED on the topic "Progress in Science and Technology during 75 years of independence of India". Certificates and prizes were given to the winners.



Observation of National Science Day: National Science Day 2022 was observed at ICMR-NICED on 28th February 2022. The theme of this year was "Integrated Approach in Science and Technology for a Sustainable Future". Following the welcome address by Dr. Shanta Dutta, Director, ICMR-NICED, Dr. Rana Bhattacharya, Assistant Professor, Department of Endocrinology, Medical College, Kolkata graced the occasion as Chief Guest and delivered a popular lecture on the topic "Changing paradigm of diabetes management and diabetes reversal". Following the lecture there was interactive discussion on the topic with the audience. All Scientists, technical, administrative, project staff and students participated to make the event successful.

International Women's Day celebration: ICMR-NICED, observed the International Women's Day on 8th March, 2022. Dr. Shanta Dutta, Director, ICMR-NICED inaugurated the program with her welcome address. Dr. Aditi Bandyopadhyay, Dept. of Physiology, IPGMER & SSKM Hospital, Kolkata delivered an inspiring talk on "Empowerment of women in the world of special needs". Next Ms. Suktisita Bhattacharya, Special Secretary, Panchayat and Rural Development Department, Govt. of West Bengal shared her experience on the role of women in Panchayat and Rural Development. Finally, Ms. Monideepa Banerjie, Independent Journalist, Ex-Executive Editor East in NDTV, Kolkata enlightened on "The role of women in the media and the different perspectives they bring to the profession". Dr. Shanta Dutta, Director, ICMR-NICED encouraged all the women staff and students of the institutes with floral memento. Participation of Scientists, administrative, technical, project staff and students made the event successful.

Project Title	:	Setting up of Nation-wide Network of Laboratories for Managing Epidemics and National Calamities (VRDL)
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, ICMR-NICED : Dr. Provash Sadhukhan, Scientist E, ICMR-NICED
Funding Agency	:	Department of Health Research
Period	:	2014 - continuing

Project Title	:	Development of a Technical Framework for establishing comprehensive surveillance system for HIV/AIDS-related mortality 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. Agniva Majumdar, Scientist C, ICMR-NICED ; Dr. Debjit Chakraborty, Scientist D, ICMR-NICED ; Dr. Subrata Biswas,Project Coordinator, NACO
Funding Agency	:	World Health Organisation, India
Period	:	2021 (4 months)

Project Title	:	Pan India Epidemiological, Virological and Genomic Surveillance for Human Influenza and COVID-19 through DHR-ICMR VRDL Network
Name of PI	:	Dr. Shanta Dutta, Director and Scientist G, ICMR-NICED
Names of CoI /CoPI / collaborators with name of collaborating institute(s)	:	Dr. Agniva Majumdar, Scientist C, ICMR-NICED
Funding Agency	:	DHR/Indian Council of Medical Research, New Delhi
Period	:	2020 - continuing

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	:	Priorities for the Environmental Dimension of Antimicrobial Resistance (AMR) in India
Name of PI	:	Dr. Shanta Dutta, Director and Scientist G, ICMR-NICED
Funding Agency	:	UNEP
Period	:	July to Dec. 2021

Project Title	:	A Prospective, Multi-centre, Randomized, Active-controlled, Observer-blind, Phase II study seamlessly followed by a Phase III study to evaluate the Safety, Tolerability and Immunogenicity of the candidate HGCO19 (COVID-19 vaccine) in healthy subject
Name of PI	:	Dr. Shanta Dutta, Director and Scientist G, ICMR-NICED
Funding Agency	:	Gennova Pharmaceuticals
Period	:	Dec. 2021 (14 months)

Project Title	:	A Prospective, Multicentre, Randomized, Active-controlled, Observer-blind, Phase II study seamlessly followed by a Phase III study to evaluate the Safety, Tolerability and Immunogenicity of the candidate GEMCOVAC19 (COVID-19 vaccine) in healthy subject

Name of PI	:	Dr. Shanta Dutta, Director and Scientist G
Names of CoI /CoPI / collaborators with name of collaborating institute(s)	:	Dr. Suman Kanungo, Scientist E Dr. Alok Kumar Chakrabarti, Scientist E Dr. Agniva Majumdar, Scientist C
Funding Agency	:	Gennova Pharmaceuticals
Period	:	2021 – ongoing

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
Names of CoI /CoPI / collaborators with name of collaborating institute(s)	: ; :	Dr. Suman Kanungo, Scientist E Dr. Ranjan Kumar Nandy, Scientist F Dr. Debjit Chakrbarty, Scientist D
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2021-2022

Project Title	:	National Repository of Antimicrobial Resistant Bacteria (NRAMRB): a facility under the "AMR Hub" for addressing AMR research across 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. Agniva Majumdar , Dr. Sulagna Basu, Dr. Asish K Mukhopadhyay, Dr. Ranjan K Nandy, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2021--2024

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
Names of CoI /CoPI / collaborators with name of collaborating institute(s)	: : : :	Dr. Alok Kr. Deb, Scientist F Dr. Suman Kanungo, Scientist E Dr. Debjit Chakraborty, Scientist D Dr. Agniva Majumdar, Scientist C
Funding Agency	:	ICMR & Foundation for Innovative New Diagnostics, Geneva
Period	:	2021 - ongoing

Project Title	:	National survey for state-wise prevalence of microbiologically confirmed pulmonary tuberculosis in India
Name of PI	:	Dr. Shanta Dutta, Director and Scientist G, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	Apr 2020 – Aug 2021

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. Debjit Chakrabarti, Dr. Agniva Majumder, Ms. Arunima Sengupta, Research Assistant
Funding Agency	:	Wellcome Trust, CMC Vellore
Period	:	Oct. 2021 to 2023

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. Alok Chakrabarti, 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
Funding Agency	:	DBT-BIRAC
Period	:	2019-2021

Project Title	:	Centre of Excellence for Climate Change and Waterborne Diseases
Name of PI	:	Dr. Shanta Dutta, Director and Scientist G, ICMR-NICED
Funding Agency	:	NCDC
Period	:	Jan 2022 for 3 months

Project Title	:	Emerging antimicrobial resistance in enteric pathogens with special reference to Shigella species
Name of PI	:	Dr. Shanta Dutta, Director and Scientist G
Funding Agency	:	NIID, Japan
Period	:	2019-2024

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
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2019 -2022

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	:	2018- ongoing

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)	:	Development of new medicine for diarrhea derived from traditional Indian folk medicine
Name of PI	:	Dr. Shanta Dutta, Scientist G & Director, ICMR-NICED
Funding Agency	:	AMED, Japan through 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 G, 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 01.04.2021 to 31.03.2024
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	:	NIH, USA through Johns Hopkins University, USA
Period	:	2018-2021
Project Title	:	Adaptive molecular diagnostics for cholera
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	:	Cambridge University through THSTI
Period	:	2021-2022
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 :2017-2022
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	:	Differential Pathogenesis in Giardia: Role of Giardia Virus
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	:	Detection of Common Enteric Parasites in Kolkata and Characterisation of the Pathogenic Factors of Local Isolates of *Giardia lamblia*
Name of PI	:	Dr. Sandipan Ganguly, Scientist F
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2017 to 2022

Project Title	:	Isolation and purification of a Novel Antiparasitic Compound from Natural Medicinal Source
Name of PI	:	Dr. Sandipan Ganguly, Scientist F, ICMR-NICED
Funding Agency	:	CSIR, New Delhi
Period	:	2018 to 2023

Project Title	:	Isolation, Identification and Molecular Characterisation of Pathogenic Factors of *Giardia lamblia*
Name of PI	:	Dr. Sandipan Ganguly, Scientist F, ICMR-NICED
Funding Agency	:	CSIR, New Delhi
Period	:	2017 to 2022

Project Title	:	Establishment of a network of ICMR-COVID-19 biorepositories in India
Name of PI	:	Dr. Shanta Dutta, Director & Scientist G, ICMR-NICED
Names of CoI /CoPI / collaborators with name of collaborating institute(s)	:	Dr. Alok Chakrabarti, Scientist D, ICMR-NICED
Funding Agency	:	ICMR
Period	:	2020-2021

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	:	2017-2021

Project Title	:	Cutting the host aids: Studying mechanistic of host cellular determinants that are usurped by rotaviral viroplasmic proteins to design novel antiviral therapeutics
Name of PI	:	Mamta Chawla Sarkar, ICMR NICED
Names of CoI /CoPI / collaborators with name of collaborating institute(s)	:	Moumita Dutta , ICMR-NICED
Funding Agency	:	ICMR
Period	:	2020- 2023

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.
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 Prasanth Borah , RMRC, Dibrugarh
	:	Dr Reeta Rasailly , ICMR, New Delhi
	:	Dr Sulagna Basu , NICED, Kolkata
Names of CoI /CoPI / collaborators with name of collaborating institute(s)	:	Dr J Mahanta, Dr K. Narain, RMRC, Dibrugarh
	:	Dr. Shanta Dutta , Dr. Ranjan Nandy, NICED, Kolkata
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.
Name of PI	:	Dr. Tapan Majumdar (AGMC, Tripura) Dr. Sulagna Basu, Scientist F, ICMR-NICED
Names of CoI /CoPI / collaborators with name of collaborating institute(s)	:	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	:	"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 / collaborators with name of collaborating institute(s)	:	Dr. Shanta Dutta, Scientist G & Director, ICMR-NICED, Dr. Agniva Majumder, Scientist C, ICMR-NICED
Funding Agency	:	Bharat Biotech International Limited
Period	:	2020 to 2022
Project Title	:	Immune response to precautionary third dose of COVISHIELD/ COVAXIN among healthy adult population: an ICMR Cohort study, India
Name of PI	:	Dr. Suman Kanungo, Scientist E
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Shanta Dutta, Director and Scientist G Dr. Alok Kumar Chakrabarti, Scientist E Dr. Shubarna Chakraborty, Scientist B
Funding Agency	:	Indian Council of Medical Research
Period	:	2022 - ongoing
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	:	Strengthening/Promoting evidence-based advocacy for influenza prevention and control in India (INSPIRE - II)
Name of PI	:	Dr. Suman Kanungo, Scientist E, ICMR-NICED
Names of CoI /CoPI / collaborators with name of collaborating institute(s)	:	Dr. Alok Chakraborty, Scientist D, ICMR-NICED
Funding Agency	:	All India Institute of Medical Sciences, New Delhi in collaboration with Centre for Disease Control and Prevention, Atlanta, USA
Period	:	2018- ongoing
Project Title	:	Studies on vascular endothelial dysfunction molecules in dengue virus infection: in search of an early potential biomarker 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, Director & Scientist G, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2020-2023 (July)
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.Hemanta Koley, Scientist E, ICMR-NICED 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 drug resistance in HCV infected patients in Easter part of India
Name of PI	:	Dr. Provash Chandra Sadhukhan, Scientist E, ICMR-NICED
Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2019-2022 (May)
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. Harpreet Kaur (Div. of ECD, ICMR Hqrs.) Dr. Provash Chandra Sadhukhan, Scientist E, ICMR-NICED(Site PI)
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Anup Kumar Das (Professor & HOD Medicine, AMCH, Assam), Dr. Sangit Dutta (GMCH, Assam), Dr. Basumoti Apum (General Hospital, Arunachal Pradesh), Dr. Khumukcham Lokeshwar Singh (JNIMS, Imphal, Manipur), Dr. Lalrothuama (Civil Hospital, Aizawl, Mizoram.), Dr. Kyrshanlang G Lynrah (NEIGRIH&MS, Meghalay), Dr. T Temsu (District Hospital, Dimapur, Nagaland), Dr. Yogesh Verma (SMIMS, Sikkim), Dr. Tapan Majumdar (AGMCH, Agartala, Tripura), Dr. B. Borkakoty (ICMR-RMRC, Dibrugarh) and Dr. Subhas Medhi (Department of Bioengineering & Technology, Gauhati University)

Funding Agency	:	Indian Council of Medical Research, New Delhi
Period	:	2018-2022 (March)
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	:	Validation study of Urinary Tract Infection Rapid diagnostic kit with antibiotic sensitivity (Rapidogram) at health facilities of West Bengal
Name of PI	:	Dr. Debjit Chakraborty
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Shanta Dutta, Director and Scientist G, Bacteriology, ICMR- NICED Dr. Agniva Majumdar, Scientist C, Bacteriology, ICMR- NICED Dr. Falguni Debnath, Scientist D, Epidemiology, ICMR- NICED Dr. Atreyi Chakrabarti, Deputy CMOH 2, S24 Pargana, Govt of WB
Funding Agency	:	ICMR
Period	:	2021-22
Project Title	:	Computational molecular modelling and interaction study between ACE2 receptor from diverse Indian human genome with the spike protein variants of SARS-CoV-2
Name of PI	:	Dr. Surajit Basak, ICMR-NICED
Funding Agency	:	ICMR
Period	:	2022-2024.
Project Title	:	Computational screening and experimental validation of autophagy modulators against *H pylori* infection: a novel approach towards drug development
Name of PI	:	Dr. Sushmita Bhattacharya, Scientist B, ICMR-NICED
Names of CoI /CoPI / collaborators with name of collaborating institute(s)	:	Surajit Basak, ICMR NICED
Funding Agency	:	DHR Grant In Aid
Period	:	2021-2024
Project Title	:	Comparative assessment of immune responses following covaxin, covishield, sputnik-V and development of a novel vaccine candidate using doggybone/ (MIDGE) DNA encoding SARSCoV2-spike protein for employing alongside current vaccines in heterologous prime-boost approach in mice
Name of PI	:	Dr. Moumita Bhaumik, Scientist C, ICMR-NICED
Names of CoI /CoPI / collaborators with name of collaborating institute(s)	: :	Dr. Aloke Chakrabarti (ICMR-NICED), Dr. Santanabha Das (Diamond Harbour Women's University)
Funding Agency	:	ICMR
Period	:	11 Jan 2022 - 10 Jan 2025
Project Title	:	Cryo-electron tomographic study of Shigella infection cycle by a newly isolated lytic myoviridae phage: a developmental approach towards optimizing phage therapy
Name of PI	:	Dr. Moumita Dutta
Funding Agency	:	DST-SERB POWER Grant

Period	:	13th July 2021-12th July 2024
Project Title	:	Exploring antimicrobial therapeutics against Multi drug Resistant enteric bacteria (MDR) causing sepsis from traditional plants of North- East India: Addressing the problem of antimicrobial resistance
Name of PI	:	Dr. Sushmita Bhattacharya, Scientist B, ICMR-NICED
	:	Indira Devi (IBSD, Imphal)
Names of CoI /CoPI / collaborators with name of collaborating institute(s)	:	Dr. Shanta Dutta, ICMR-NICED Dr. Sulagna Basu, ICMR-NICED Prof. Pulak Mukherjee (IBSD, Imphal) Department of Biotechnology, Govt. of India
Funding Agency	:	DBT
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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
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ADMINISTRATION

Scientific Advisory Committee:

Chairperson	Dr. Sanjay Mehendale Former ADG, ICMR & Research Director PD Hinduja Hospital, PD Hinduja Hospital SVS Rd, Mahim West, Shivaji Park, Mumbai 400016
Member	Dr. Rama Chaudhry Prof. & Head, Department of Microbiology All India Institute of Medical Sciences, New Delhi
Member	Dr. Pramod Kr. Garg Executive Director, Translational Health Science and Technology Institute, Faridabad
Member	Prof. Dipendra Kr. Mitra Professor & HOD, Department of Transplant Immunology and Immunogenetics, AIIMS, New Delhi
Member	Dr. Saumitra Das Director, National Institute of Biomedical Genomics P.O.: N.S.S., Kalyani 741251, WB
Member	Prof. (Dr.) Subhasish Kamal Guha Director, Calcutta School of Tropical Medicine 108, C. R. Avenue, Kolkata – 700073 Member Prof. Shashi Kant Professor & HoD, Centre for Community Medicine, Room No.25, Old OT Block, All India Institute of Medical Sciences, Ansari Nagar, New Delhi - 110029
Member	Dr. Indrani Gupta Prof. & Head, Health Policy Research Unit, Institute of Economic Growth, University Enclave, Delhi 110007
Member	Dr. Ajay Chakraborty Director General of Health Services Swasthya Bhawan, GN29. Sector V, Bidhannagar, Kolkata 700091
Representative from ICMR-Member	Dr. Kamini Walia, Scientist-F, Division of ECD
Member Secretary	Dr. Shanta Dutta, Director, ICMR-NICED

Institutional Animal Ethics Committee:

Chairman, Biological Discipline	Dr. M.K. Chakrabarti Ex-Director-in-Charge & Ex-Emeritus Scientist, ICMR-NICED, Kolkata

Member, Biological Discipline	Dr. Amit Pal Scientist-F, ICMR-NICED, Kolkata
Member, Biological Discipline	Dr Santa Sabuj Das Scientist-F, ICMR-NICED, Kolkata
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Member, Link Nominee, CPCSEA	Dr. Shankar Maiti Dept. of Biological Sciences, IISER-K, Mohanpur, Nadia, West Bengal
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Member, Socially Aware Nominee, CPCSEA	Dr. Samiran Mondal Assistant Professor, Dept. of Veterinary Pathology, West Bengal University of Animal Fishery Science 37, Kshudiram Bose Sarani, Kolkata
Member Secretary	Dr. Hemanta Koley Scientist-E, ICMR-NICED, Kolkata

Institutional Ethics Committee:

Chairperson	Prof. Santanu K. Tripathi Professor & Head Department of Clinical & Experimental Pharmacology Calcutta School of Tropical Medicine 108 Chitta Ranjan Avenue. Kolkata 700073
Basic Medical Scientist (Member)	Dr. Manideepa Sengupta Professor & Head, Department of Microbiology, Medical College Kolkata AE 426 Salt Lake, Kolkata- 700064
Basic Medical Scientist (Member)	Prof. Suparna Chatterjee Department of Pharmacology Institute of Post Graduate Medical Education and Research (IPGMER) AJC Bose Road, Kolkata
Member, Clinician	Dr. Dilip Mahalanabis Director, Society for Applied Studies, CF 198, Saltlake, Sector I, Kolkata
Member, Clinician	Prof. Santi Ranjan Bagchi Prof. & Head, Dept. of Medicine College of Medicine & J.N.M. Hospital S-3/1, Shraboni Abasan, Block- FC, Sector III, Salt Lake, Kolkata

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Member, Legal Expert	Mr. Chinmoy Guhathakurta 792/1 Raj Danga Main Road, Kolkata
Member, Lay Person (Floweriest)	Mrs. Anasuya Basu 129/35 S. N. Roy Road, LIC Officer Colony, Kolkata
Member, Lay Person	Mr. Tapan Kanti Sengupta 26/12 Jhil Road, Dhakuria, Kolkata
Clinician (Member Secretary)	Dr. Phalguni Dutta Former Emeritus Medical Scientist (ICMR) ICMR-National Institute of Cholera & Enteric Diseases Beliaghata, Kolkata

Institutional Biosafety Committee (IBSC):

Chairman	Dr. Shanta Dutta Director & Scientist G
DBT Nominee	Dr. Alok Sil Prof. University of Calcutta
Member Secretary	Dr. Asish Kr Mukhopadhyay Scientist F
Outside Expert	Dr. Rupak Kr. Bhadra Ex-Chief Scientist, CSIR-IICB, Kolkata
Biosafety Officer	Dr. Alok Kr Deb Scientist F, ICMR-NICED
Member (Internal Expert)	Dr. Sulagna Basu Scientist F, ICMR-NICED
Member (Internal Expert)	Dr. Hemanta Koley Scientist E, ICMR-NICED

Right to Information Act (RTI):

Upto 6th September, 2021

RTI Appellate Authority	Dr. Amit Pal Scientist-F
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

7th September, 2021 onwards

RTI Appellate Authority	Dr. Amit Pal Scientist-F
Nodal Officer of RTI Online Portal	Dr. Ranjan Kr. Nandy, Scientist-F
CPIO (Central Public Information Officer)	Dr. Sulagna Basu, Scientist-F
CPIO	Mr. Sunil Bernard, Sr. Private Secretary Administrative Officer
DPIO	Mr. Avijit Chakraborty, Technical Officer

SC/ST Cell

Chairperson/Liaison Officer	Dr. Amit Pal, Scientist F
Member	Dr. Sandipan Ganguly, Scientist 'F'
Member	Dr. Pallavi Indwar, Scientist 'C'
Member	Mr. Vishwanath Besra, Section Officer
Member	Mr. Dipak Kr. Gayen, Section Officer

OBC Cell

Chairperson/Liaison Officer	Dr. Provash Chandra Sadhukhan, Scientist E
Member	Dr. Falguni Debnath, Scientist C
Member	Dr. Moumita Dutta, Scientist C
Member	Administrative Officer
Member	Mr. Prosenjit Guha, Assistant

Grievance Cell

Chairperson	Dr. Mamta Chawla Sarkar, Scientist-F
Member	Dr. Asish Kumar Mukhopadhyay, Scientist-F
Member Secretary	Mr. Tapas Paul, Sr. TO (1)
Member	Administrative Officer
Member	Mr. Vishwanath Besra, Section Officer

Legal Cell

Chairperson	Dr. Amit Pal, Scientist-F
Member	Dr. Ranjan Kr. Nandy, Scientist-F
Member Secretary	Administrative Officer
Member	External Legal Expert
Member	Mr. Viswanath Besra, Section Officer

Internal Complaints Committee of ICMR-NICED for Sexual Harassment of Women at Workplace

Chairperson	Dr. Sulagna Basu, Scientist-F
Member	Dr. Falguni Debnath, Scientist-C
Member	Administrative Officer
Member Secretary	Ms. Saheli Samanta, Sr.TO-2
External Member from NGO	Dr. Miratun Nahar, President, Talash, NGO
Co-opted member	Dr. Moumita Bhaumick, Scientist C

Library Committee:

Chairperson	Dr. Sandipan Ganguly, Scientist-F
Member	Dr. Provash Chandra Sadhukhan, Scientist-E
Member	Dr. Moumita Bhaumick, Scientist-C
Member	Dr. Surajit Basak, Scientist-C
Member	Administrative Officer
Coordinator	Mrs. Saheli Samanta, Sr. TO (2)
Member	Mr. Tapas Pal, Sr. TO (1)

Purchase Committee:

Chairperson	Dr. Amit Pal, Scientist-F
Member	Dr. Provash Ch. Sadhukhan, Scientist-E
Member	Administrative Officer
Member	Store-in-Charge, ICMR-NICED

Web Committee:

Chairperson	Dr. Shanta Dutta, Director & Scientist G
Acting Chairperson	Dr. Sandipan Ganguly, Scientist F
Member Secretary	Mrs. Saheli Samanta, Sr. T.O (2)
Resource person	Dr. Nilanjan Chakraborty, Scientist-F
Resource person	Dr. Debjit Chakrabarty, Scientist-D
Resource person	Dr. Falguni Debnath, Scientist-C
Information provider	Administrative Officer
Information provider	Accounts Officer
Information provider	Mr. Sunil Bernard, Private Secretary
Coopted Member	Dr. Santa Sabuj Das, Scientist F
Coopted Member	Mr. Tapas Pal, Sr. TO-1

Official Language Implementation Committee:

Chairperson	Dr. Shanta Dutta, Director & Scientist G
Acting Chairperson	Dr. Mamta Chawla Sarkar, Scientist-F
Member	Dr. Falguni Debnath, Scientist-C
Liaison Officer	Administrative Officer
Member	Ms. Arpita Sarbajna, Sr.TO (1)
Member	Mr. Sunil Bernard, Sr. Private Secretary
Member	Mr. Sudhir Omesh, TO-A
Member	Mr. Vishwanath Besra, Section Officer

Staff List

Scientists:

Dr. S. Dutta, Scientist G & Director
Dr. A. Pal, Scientist F
Dr. R. K. Nandy, Scientist F
Dr. A.K. Deb, Scientist F
Dr. A. K. Mukhopadhyay, Scientist F
Dr. S. Das, Scientist F
Dr. S. Ganguly, Scientist F
Dr. M. Chawla Sarkar, Scientist F
Dr. S. Basu, Scientist F
Dr. N. Chakraborty, Scientist F
Dr. H. Koley. Scientist E
Dr. S. Kanungo, Scientist E
Dr. S. Mukhopadhyay (Joined on 29.07.2021)
Dr. P. C. Sadhukhan, Scientist E
Dr. A. K. Chakrabarti, Scientist E
Dr. D. Chakraborty, Scientist D
Dr. F. Debnath, Scientist C
Dr. A. Sinha, Scientist C (transferred to ICAM on 12.07.2021)
Dr. M. Bhaumik (Ghosh), Scientist C
Dr. M. Dutta, Scientist C
Dr. S. Basak, Scientist C
Dr. P. Indwar, Scientist C
Dr. A. Majumdar, Scientist C
Dr. S. Bhattacharya, Scientist B
Dr. M. Bardhan, Scientist B (Joined on 13.09.2021)
Dr. Subarna Chakraborty, Scientist B (Joined on 13.09.2021)
Ms. Monica Sharma, Scientist B (Joined on 17.03.2022)

Bacteriology Division

Mr. A. K. Mondal	Technical Officer A (retired on 28.02.2022)
Mr. S. R. Ghosh	Technical Officer A
Mr. A. Ganai	Technical Officer
Ms. M. Mallick	Technical Officer
Mr. T. Barman	Technical Officer
Mr. S. De	Technical Officer
Ms. M. Das	Technical Assistant
Mr. P. Samanta	Laboratory Assistant
Mr. S. Dey	MTS (General)

Epidemiology and Data Management Division

Mr. C. Mandal	Sr. Technical Officer (1), (Posted at Store Section)
Mr. A. Chakraborty	Technical Officer (Posted at Personnel Section)
Mr. S. Basu	Health Assistant (retired on 30.09.2021)

Clinical Medicine Division

Mr. A. Pal	Technical Officer
Mr. K. G. Saha	Laboratory Assistant
Mr. S. Turi	Laboratory Assistant (Retired on 30.11.2021)
Mr. A. Pramanik	MTS (General)

Immunology Division

Mr. S. K. Shaw	Technician B (retired on 30.11.2021)
Mr. N. C. Mondal	Laboratory Assistant

Parasitology Division

Mr. B. Ganguly	Technician - 2 (2nd half duty)

Electron Microscopy Division

Ms. A. Sarbajna	Technical Officer - C
Mr. B. R. Mallick	Laboratory Attendant - 2

Pathophysiology Division

Mr. B. Roy	Technician (2)

Virology Division

Mr. S. Omesh	Technical Officer –A (Posted at Store section)
Ms. P. Bhaumik	Technical Officer
Ms. P. De	Technical Officer
Md. M. Hossain	Sr. Technician (1)
Ms. C. Das	Laboratory Assistant

Library

Ms. S. Samanta	Sr. Technical Officer (2)
Mr. T. Pal	Sr. Technical Officer (1)
Mr. S. K. Routh	Laboratory Assistant

Department of Animal House

Mr. K. C. Pramanik	Sr. Technical Officer (1) (retired on 31.03.2022)
Mr. K. C. Tudu	Technical Assistant (voluntarily retired on 01.01.2022)
Mr. R. Hazra	Laboratory Assistant
Mr. S. Balmiki	Laboratory Assistant

Maintenance, Instruments & Equipment Section

Mr. K. Dey	Sr. Technician - 2
Mr. B. Mandi	Laboratory Assistant
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

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. T. S. Gopakumar	Administrative Officer (joined on 07.07.2021
Mr. S. Bernard	Private secretary (AO additional Charge till 06.07.2021)
Mr. R. Jaiswal	Upper Divisional Clerk

Accounts Section

Mr. P. Chatterjee	Accounts Officer (transferred to RMRC Bhubaneshwar on 17.12.2021)
Mr. S. Mullick	Assistant
Mr. D. Kumar Gayen	Section Officer
Mr. A. Banerjee	Telephone Operator
Mr. M. S. Das	Lower Division Clerk (posted at Cash section)

Cash Section

Mr. C. Naskar	Assistant (retired on 31.01.22)
Mr. Arup Chandra	Upper Division Clerk

Dispatch Section

Mr. B. Roy	Laboratory Assistant
Mr. J. Malakar	Laboratory Assistant

Establishment Section

Ms. S. Samanta	Sr. TO 2 (additional duty since 01.03.2021)
Mr. A. Mitra	Sr. Technician 3 (retired on 31.01.2022)
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. S. Adhikary	Laboratory Assistant

Store Section

Mr. S. Omesh	Technical Officer-A
Mr. C. Mandal	Sr. Technical Officer (1), (Posted at Store Section)
Mr. B. Mitra	Laboratory Assistant (retired on 31.08.2021)

Pension Section

Mr. V. Besra	Section Officer (posted at Personnel and Pension Section since April 2021)
Mr. K. Sharma	Upper Division Clerk

Personnel Section

Mr. V. Besra	Section Officer (posted at Personnel and Pension Section since April 2021)
Mr. A. Kumar	Section Officer (transferred to RMRC Bhubaneshwar on 31.08.2021)
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. D. Dey	Technician 2
Mr. S. Ghosh	Technician 2

Regional VRDL, ICMR-NICED

Scientist:

Dr. Ashis Debnath	Scientist C (Medical)
Dr. Soumen Mukherjee	Scientist C (Non-Medical)
Dr. Pradip Kumar Jana	Scientist B (Medical)
Dr. Ananya Chatterjee	Scientist B (Non-Medical)

Staff:

Ms. Madhumonti Biswas	Research Assistant
Mr. Rudrak Gupta	Research Assistant
Ms. Shreema Chakraborti	Laboratory Technician
Mr. Satyabrata Ghorai	Laboratory Technician
Mr. Chinmoy Mondal	Laboratory Technician
Mr. Souvik Kar	Laboratory Technician

Mr. Soumodip Mitra	Data Entry Operator
Mr. Nayan Basuli	Data Entry Operator
Mr. Bithin Banerjee	Data Entry Operator
Mr. Biswajit Dey	MTS
Mr. Tapan Turi	MTS
Mr. Kartick Ch. Mondal	MTS
Mr. Asish Kumar Jana	MTS
Mr. Avisek Sinha	MTS
Mr. Buddhadeb Das	MTS
Ms. Baisakhi Ghosh	MTS

Scientists Associated with ICMR-NICED

Dr. A. Ghosh	NASI-Honorary Scientist,
Dr. M. K. Chakrabarti	ISCA Ashutosh Mookherjee Fellow
Dr. K. Sarkar	Director, NIOH
Dr. P. Das	ICMR Emeritus Scientist
Dr. T. Ramamurthy	INSA Senior Scientist

Employees who Joined ICMR-NICED during 2021-22

Name	Designation	Date of Joining
Mr. T. S. Gopakumar	Administrative Officer	07.07.2021
Dr. S. Mukhopadhyay	Scientist E	29.07.2021
Dr. M. Bardhan	Scientist B	13.09.2021
Dr. S. Chakraborty	Scientist B	15.09.2021
Dr. J. B. A. Tiewsoh	Scientist B	30.09.2021
Ms. M. Sharma	Scientist B	17.03.2021

Employees who left/ transferred from ICMR-NICED during 2021-22

Name	Designation	Date of transfer
Dr. A. Sinha	Scientist C	12.07.2021
Mr. P. Chatterjee	Accounts Officer	17.12.2021
Mr. A Kumar	Section Officer	13.09.2021

Employees who retired from ICMR-NICED during 2020-21

Name	Designation	Date of retirement from service
Mr. Keshab Chandra	Pramanik Sr. Technical Officer (1)	31.03.2022
Mr. Ashoke Kumar Mondal	Technical Officer-A	28.02.2022
Mr. Atanu Mitra	Sr. Technical Technician-3	31.01.2022
Mr. Chinmoy Kumar Naskar	Section Officer	31.01.2022
Mr. Kandan Chandra Tudu	Technical Assistant	01.01.2022 (Voluntary Retirement)
Mr. Subal Turi	Laboratory Assistant	30.11.2021
Mr. Swapan Kumar Shaw	Technician B	30.11.2021
Mr. Supriya Basu	Technical Officer	30.09.2021
Mr. Bimal Mitra	Laboratory Assistant	31.08.2021

Obituary…our tribute and homage

"You will always be remembered…rest in eternal peace"

Name		Passed away on
Lt. Gobinda Kundu	Ex-Assistant	23.04.2021
Lt. N. C. Mukherjee	Ex-Sr. TO (2)	03.05.2021
Lt. S. K. Prodhan	Ex-Laboratory Assistant	09.11.2021
Lt. S. K. Paul	Ex-Technical Assistant	22.01.2022

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