2023-24

ICMR-NIRBI

ACHIEVEMENT & ACTIVITY REPORT

आई.सी.एम.आर-राष्ट्रिय जीवाणु संक्रमण अनुसंधान संस्थान

ICMR-National Institute for Research in Bacterial Infections

स्वास्थ्य अनुसंधान विभाग / Department of Health Research

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

भारत सरकार / Government of India

WHO Collaborating Centre for Research and Training on Diarrhoeal Diseases

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2023-2024

INDIAN COUNCIL OF MEDICAL RESEARCH

NATIONAL INSTITUTE OF RESEARCH IN BACTERIAL INFECTIONS

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

Dr. Shanta Dutta, Scientist G. & Director	Chairperson
Dr. Alok Kr. Deb, Scientist G	Member
Dr. Sulagna Basu, Scientist G	Member
Dr. Debjit Chakraborty, Scientist E	Member
Mrs. Saheli Samanta, TO-C	Member

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

The year 2023 ushered a new dawn as ICMR- NICED initiated multidisciplinary studies to combat Anti-microbial resistance (AMR), a new threat to the world.National Repository of Antimicrobial Resistant Bacteria (NRAMRB) is fully functional and is characterizing and cataloguing antibiotic resistant isolates from hospitals and researchers across India. The Antimicrobial Stewardship program at all tiers of health care delivery in WB has generated data on organisms and their AST profile of common infections like diarrhoeal diseases, urinary tract infection, ARI, and fever for developing district specific antibiotic prescription guideline for such infections. In addition, ICMR-NICED has validated a Point-of-Care Rapid UTI Antibiogram kit (Rapidogram) in peripheral health facilities of West Bengal. Based on our recommendation the manufacturer has improved the kit, which has been taken up by National Health System Resource Centre for implementation in NHM. The institute also developed a low-cost nested PCR assay directly from the biopsy samples for the rapid detection of clarithromycin-resistant Helicobacter pylori strains, providing rapid initiation of effective antibiotic treatment, avoiding empirical therapy.

The scientists of ICMR NICED have also initiated new projects on other health priorities of public health importance such as infectious enteric diseases,Irritable bowel syndrome (IBD), acute encephalitis syndrome (AES), meningitis, Influenzaand Dengue. Estimation of Typhoid burden across India was done by ICMR-NICED as part of a multi centric study across India, showing high burden of Typhoid in urban India, thus addressing the issue of introduction of typhoid vaccine in the public health care delivery system. ICMR-NICED was also part of a first ever multicentric study that looked at the burden of influenza among older adults above 60 years in India and assessed the cost-effectiveness of a vaccination program against it. The study highlighted the high burden of influenza and immunizing adults above 60 years of age by either a facility or outreach -based approach would be very cost-effective.ICMR-NICED's involvement in the comparative immunogenicity and safety study of Oral Cholera Vaccines (OCV) Euvichol-Plus with Shanchol demonstrated the non-inferiority of Euvichol-Plus to Shanchol, contributing to the licensure of Euvichol-Plus for use in India.

NICED continued to provide virus diagnostics and genotyping service to the state through regional VRDL and NACO referral lab. First report for full genome sequences of circulating Norovirus strains and recombinant Adenovirus 7/3 from eastern India has implications in country specific vaccine design and introduction.

NICED also continued its efforts towards translation research. Diagnostic assays for identifying multiple enteric parasites andgold nanoparticle-aptamer complexbased detection of HCV in blood samples were successfully developed and validated. Vaccine candidates against Campylobacter jejuni and Salmonella sppwere developed and their immunogenicity was assessed in animal model.Minocycline a semi-synthetic derivative of tetracycline, shows significant antiviral activity at non-toxic doses against Influenza A virus strains both in vitro and in vivo (mice model). Anti-cancer activity of microbial extracellular proteases such as subtilisin and M84 isolated from environmental microbes was established. In addition, various plant based compounds and bacteriophages have been identified and tested for antimicrobial activity against Shigella species, Salmonella spp, H. pylori, enteric parasites and rotavirus in vitro and in vivo animal model.

In this financial year, NICED has published 71 research articles with the average impact factor 6.3, with highest impact factor 158.5 (2022). A total of 45 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. During 2023-24, 53 PhD students and 66 summer interns were trained at ICMR-NICED and 9 students were awarded PhD degree. A total of 560 participants including physicians and health care workers were trained through 14 workshops and training programs.A total of 60 participants were trained on Biosafety and Biosecurity issues.

ICMR-NICED has been working on diarrhoeal diseases and other enteric diseases for the past 62 years. Now with the changing National health priorities, NICED is expanding its research focustowards translational research like development of vaccines, alternative therapeutics and diagnostics with an aim to combat AMR. Thus the institute is transitioning towards change in its name and mandate. The new name of ICMR-NICED has been proposed as ICMR-National Institute for research in Bacterial Infections.

During this journey of ICMR-NICED towards ICMR-NIRBI, contributions of all permanent or contractual staff and the research fellowsis noteworthy which has enabled the institute to get national and international recognition.

Shanta Dutta
Director

CONTENTS

S. Dutta (Principal Investigator), Bacteriology Division

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

Project Investigator: Dr. Shanta Dutta

Name of the student: Gourab Haldar, SRF

Blood-borne infections caused by Carbapenem-resistant *Enterobacter cloacae* complex (CR-ECC) are major public health threats with respect to the challenges encountered during treatment. The study describes the WGS-based molecular characterisation of blood isolates (n=70) of CR-ECC from patients admitted to the ICU of tertiary care hospitals in Kolkata, India during 2017-2022 with respect to species identification, antimicrobial resistance (AMR) profiling, mechanism of drug resistance and molecular subtypes. Vitek2 MALDI and species-specific PCR identified *E. hormaechei* subsp. *xiangfangensis* (47.14%) as the emerging CR-ECC subspecies in Kolkata. The predominant carbapenemase and ESBL genes found were bla_{NDM-1} (51.42%) and $bla_{CTX-M-15}$ (27%) respectively. Besides, bla_{NDM-4}, bla_{NDM-5}, bla_{NDM-7}, bla_{CMH-3}, bla_{SFO-1}, $bla_{OXA-181}$, $bla_{OXA-232}$, bla_{KPC-3}, and bla_{DHA-7} genes were also detected which were not previously reported from India (Fig. 1). A multitude of Class 1 integrons (including In180, In4874, In4887 and In4888 which were novel) and plasmid replicon types (IncFIB, IncFII, IncX3, IncHI1-HI2, IncC and IncR) involved in AMR dissemination were identified (Fig. 2). RT-PCR and western blot revealed that carbapenem resistance in non-carbapenemase producing CR-ECC isolates was contributed by elevated levels of *ampC*, overexpression of *acrAB* and loss of *ompF*. A total of 30 distinct STs were ascertained by MLST (Fig. 3); of which ST2011, ST2018, ST2055, ST2721, ST2722 were novel STs. PFGE analysis (Fig. 4) showed heterogeneity (69 pulsotypes with similarity co-efficient of 48.40%) among the circulating isolates suggesting multiple reservoirs of infections in humans. Phylogenetically and genetically diverse CR-ECC with multiple AMR mechanisms indicates the challenges in controlling such infections and mandates close monitoring of nosocomial infections caused by these organisms to forestall their transmission

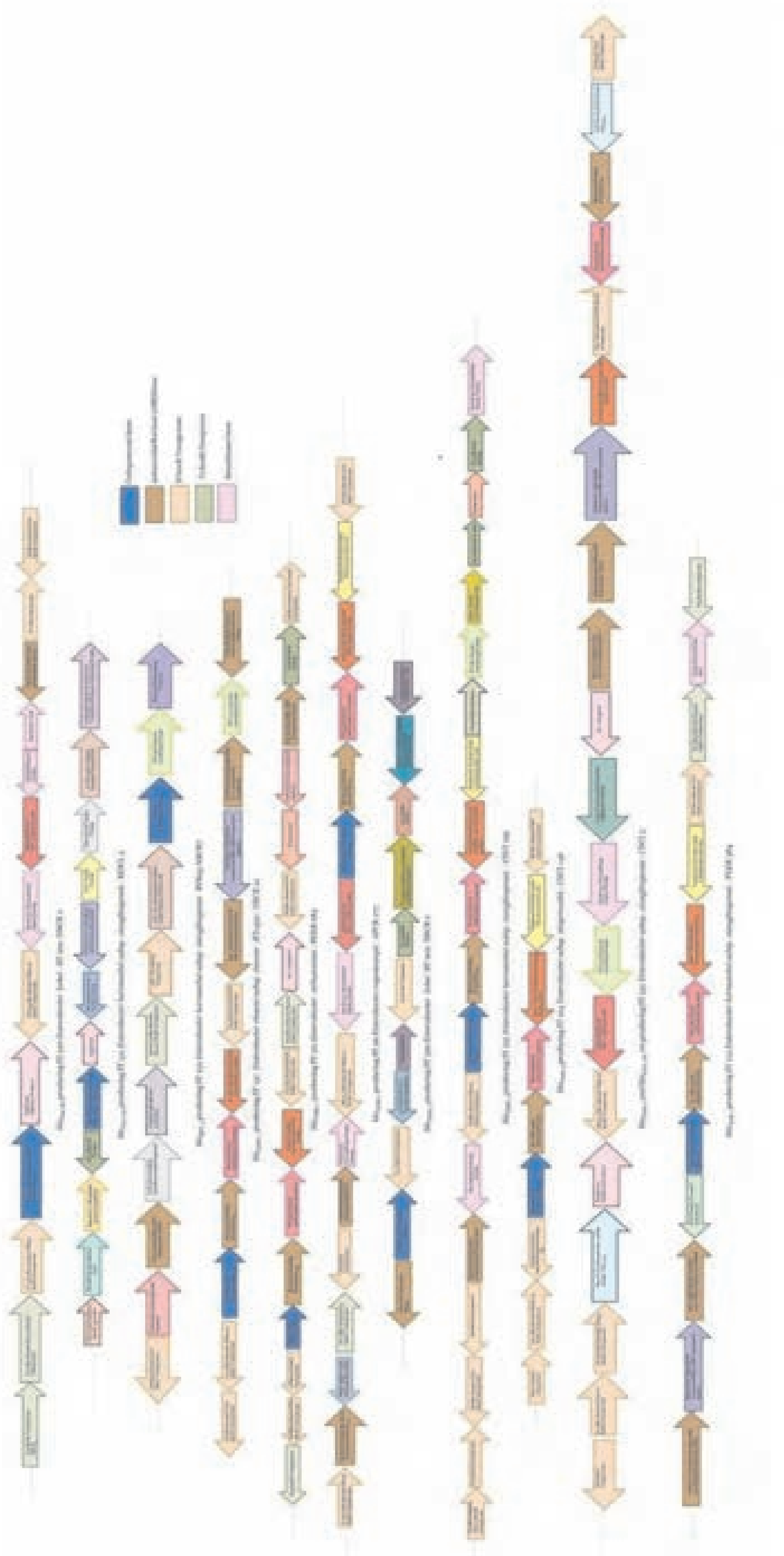


Fig 1: Schematic representation of the genetic environment of the various carbapenemase (*bla*$_{OXA-48}$-like variant, *bla*$_{KPC}$, and *bla*$_{NDM}$) identified in our study.

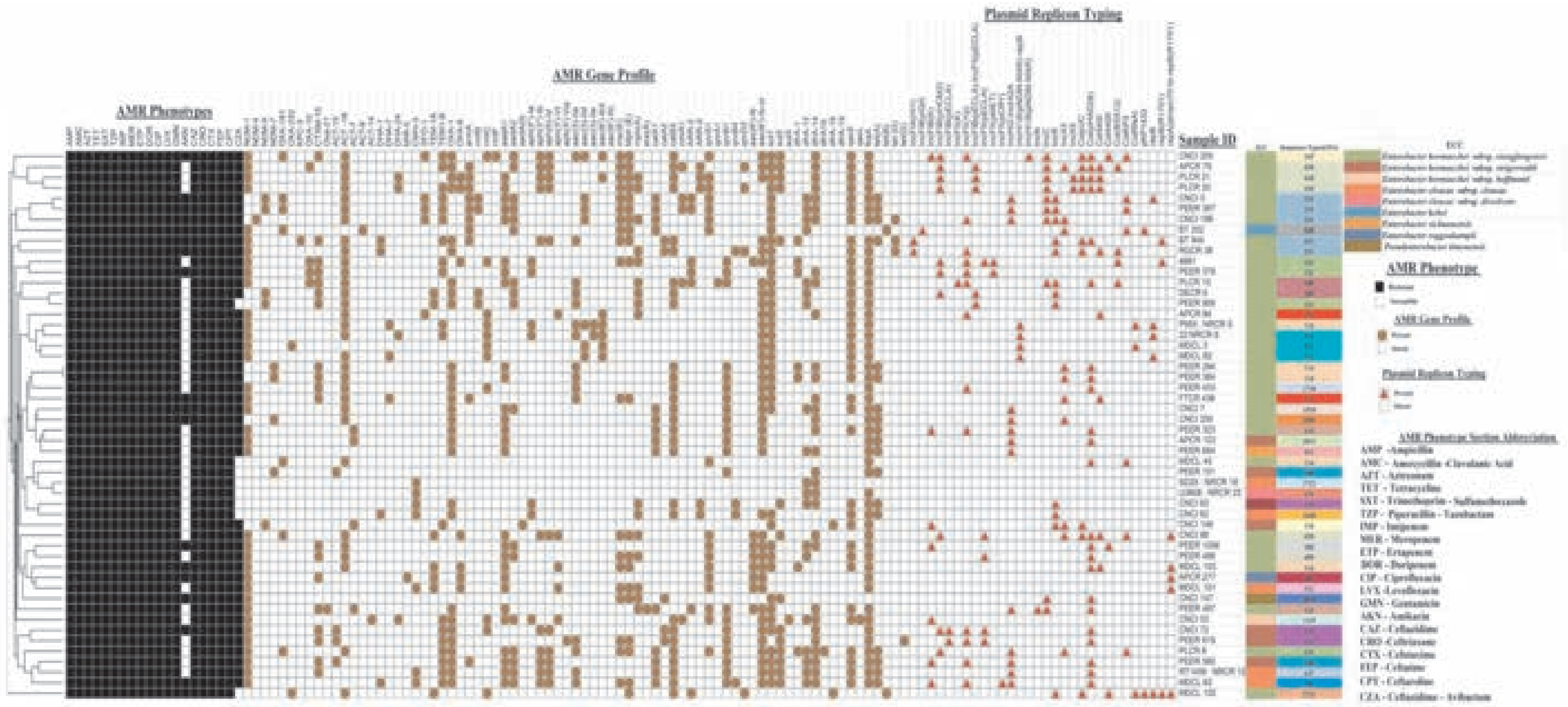


Fig 2: Heatmap of CR-ECC study isolates depicting respective AMR phenotype, AMR gene, plasmid replicon typing and sequence types. Cluster analysis was performed on the heatmap using Euclidean distance.

Fig 3: Minimum Spanning Tree (MST) based on MLST allelic profile: Pictorial depiction of genetic relationship of different sequence types (ST) of ECC-CR clinical isolates found in this study by goeBURST and PHYLOViZ 2.0. Each kurtosis or nodes (circle) corresponds to one ST designated by a particular number, and the size of the circle is proportional to the number of isolates (genomes). Each circle is divided into cross sections of different colours. Each colour represents the different countries in which the STs are found (genomes downloaded from the pubMLST database, last accessed on 25.09.2023). The numbers on the branches represent the allelic differences. Branches with a length greater than three locus variants are outlined in dashes. All the STs obtained in this study (India) are represented in red colour; all have been validated and curated by the pubMLST curator, and this now available at the pubMLST website. The red-coloured circles with yellow halo (ST2011, ST2018, ST2055, ST2721, ST2722, ST 2869, ST2951 and ST3006) depicts the novel STs discovered in this study. ST96, ST124, ST346, ST407, ST265, ST267, ST1119, ST1446 and ST1730 although, represented only in red colour but these are not exclusive to India rather our study. This representation is because the pubMLST has only sanger sequence but no whole genome records for these STs.

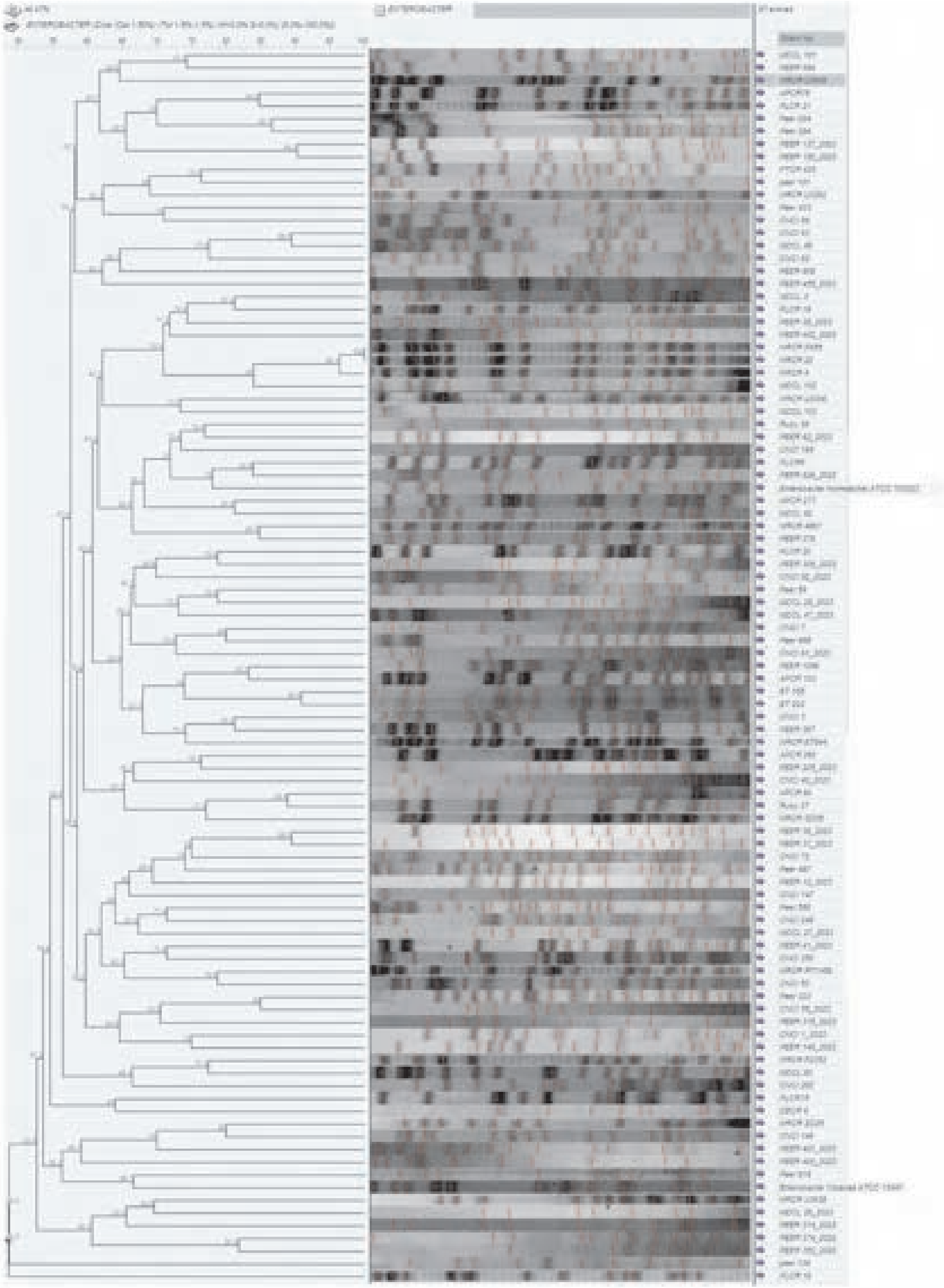


Fig 4: Dendrogram of Pulsed Field Gel Electrophoresis (PFGE) cluster analysis of *Xba*I-digested patterns of 95 carbapenem non-susceptible *Enterobacter cloacae* complex (ECC) isolates. *Enterobacter cloacae* ATCC 13047 and *Enterobacter hormaechei* ATCC 700323 were used as positive controls for PFGE

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

Project Investigator: Dr. Shanta Dutta
Name of the student: Sunayana Saren, SRF

After computational docking studies the oral toxicity of the selected compounds were virtually predicted by ProTox-II, a virtual lab for the prediction of toxicities of small molecules (table1). Out of selected compounds, 13 compounds which were available were purchased and their MIC and MBC were detected against three *Salmonella* strains (viz. MTCC734, KOL557 and KOL558) by performing microbroth dilution (Table 2). It was observed that out of the tested compounds, Apigenin and Acacetin had a greater effect in terms of MIC followed by luteolin. Compounds like 6-Methoxybenzoxazolinone, 2-Benzoxazolinone, Nicotinic Acid, P-Coumaric acid, Cirsiliol, and Cirsimaritin had a bactericidal effect whereas Kaempterol-3-rutinoside, Nevadensin, Luteolin, Apigenin, and Acacetin had a bacteriostatic effect. In further studies we selected five compounds which were 6-Methoxybenzoxazolinone (MBOA), 2-Benzoxazolinone (BOA), Luteolin, Apigenin and Acacetin. The cytotoxicity of the selected compounds was tested on RAW264.7 cell line (macrophage) where it was observed that the MBOA and BOA had less toxicity than three other compounds (Fig. 5). Further the invasion assay was performed where RAW264.7 cell lines were infected with *Salmonella* Typhi and the efficacy of the compounds to stop the invasion were observed (Fig. 6). The anti-biofilm activity of MBOA and BOA were tested against *Salmonella* Typhi (Fig. 7). The in vivo assay on toxicity and efficacy studies of selected compounds are currently undertaken.

Table 1: Predicted oral toxicity of selected compounds

Serial no.	Compounds	Predicted LD50*	Predicted Toxicity Class**
1	(2R)-7-methoxy-2H-1,4-benzoxazin-3(4H)-one 2-O-β-galactopyranoside	1380mg/kg	4
2	2-Benzoxazolinone	890mg/kg	4
3	5,7,4`-trihydroxy-3`-methoxyisoflavone	2500mg/kg	5
4	6-methoxybenzoxazolinone	1310mg/kg	4
5	Acacetin	4000mg/kg	5
6	Apigenin	2500mg/kg	5
7	Betulinic acid	2610mg/kg	5
8	Cirsiliol	4000mg/kg	5
9	Cirsimaritin	4000mg/kg	5
10	Luteolin	3919mg/kg	5
11	Nevadensin	3919mg/kg	5
12	Nicotiflorin	5000mg/kg	5
13	Nicotinic Acid	3720mg/kg	5
14	P-Coumaric acid	2850mg/kg	5
15	Stigmasterol	890mg/kg	4
16	Trihydroxyoctadecadienoic acid	3389mg/kg	5
17	Tuberonic acid glucoside	55mg/kg	3

*LD50 is the lethal dose that killed half of the population of animals exposed.

**Toxicity classification as per Globally Harmonized System (GHS)
Class 1: ≤5mg/kg; Class 2: 6-50mg/kg; Class 3: 51-300mg/kg; Class 4: 301-2000mg/kg; Class 5: 2001-5000mg/kg; Class 6: >5000mg/kg (class 1 being highly toxic and class 6 being non-toxic)

Table 2: MIC and MBC of selected compounds of *S. dulcis* root against *Salmonella* Typhi Strains (MTCC734, KOL557 and KOL558)

Serial no	Compounds	MIC_{90} (mg/ml)			MBC (mg/ml)		
		MTCC734	KOL557	KOL558	MTCC734	KOL557	KOL558
1	6-Methoxybenzoxazolinone	≤ 0.46 (> 0.23)	≤ 0.93 (> 0.46)	≤ 0.93 (> 0.46)	≤ 1.87 (> 0.93)	≤ 0.93 (> 0.46)	≤ 0.93 (> 0.46)
2	Betulinic Acid	≤ 7.5 (> 3.75)	≤ 7.5 (> 3.75)	≤ 7.5 (> 3.75)	> 7.5	> 7.5	> 7.5
3	2-Benzoxazolinone	≤ 0.93 (> 0.46)	≤ 0.93 (> 0.46)	≤ 0.93 (> 0.46)	≤ 3.75 (> 1.87)	≤ 1.87 (> 0.93)	≤ 1.87 (> 0.93)
4	Nicotinic Acid	≤ 0.93 (> 0.46)	≤ 1.87 (> 0.93)	≤ 1.87 (> 0.93)	≤ 3.75 (> 1.87)	≤ 3.75 (> 1.87)	≤ 3.75 (> 1.87)
5	Stigmasterol	> 15	> 15	> 15	> 15	> 15	> 15
6	P-Coumaric acid	≤ 7.5 (> 3.75)	≤ 7.5 (> 3.75)	≤ 3.75 (> 1.87)	≤ 15 (> 7.5)	≤ 15 (> 7.5)	≤ 3.75 (> 1.87)
7	Kaempterol-3-rutinoside	≤ 1.87 (> 0.93)	≤ 1.87 (> 0.93)	≤ 1.87 (> 0.93)	≤ 7.5 (> 3.75)	≤ 7.5 (> 3.75)	≤ 7.5 (> 3.75)
8	Nevadensin	≤ 1.87 (> 0.93)	≤ 1.87 (> 0.93)	≤ 1.87 (> 0.93)	≤ 7.5 (> 3.75)	≤ 7.5 (> 3.75)	≤ 7.5 (> 3.75)
9	Luteolin	≤ 0.23 (> 0.11)	≤ 0.46 (> 0.23)	≤ 0.23 (> 0.11)	≤ 1.87 (> 0.93)	≤ 1.87 (> 0.93)	≤ 1.87 (> 0.93)
10	Apigenin	≤ 0.23 (> 0.11)	≤ 0.23 (> 0.11)	≤ 0.23 (> 0.11)	≤ 3.75 (> 1.87)	≤ 3.75 (> 1.87)	≤ 3.75 (> 1.87)
11	Acacetin	≤ 0.23 (> 0.11)	≤ 0.23 (> 0.11)	≤ 0.23 (> 0.11)	≤ 1.87 (> 0.93)	≤ 1.87 (> 0.93)	≤ 1.87 (> 0.93)
12	Cirsiliol	≤ 1.87 (> 0.93)	≤ 1.87 (> 0.93)	≤ 1.87 (> 0.93)	≤ 7.5 (> 3.75)	≤ 7.5 (> 3.75)	≤ 7.5 (> 3.75)
13	Cirsimaritin	≤ 0.8 (> 0.4)	≤ 0.8 (> 0.4)	≤ 0.8 (> 0.4)	≤ 3.2 (> 1.6)	≤ 3.2 (> 1.6)	≤ 3.2 (> 1.6)

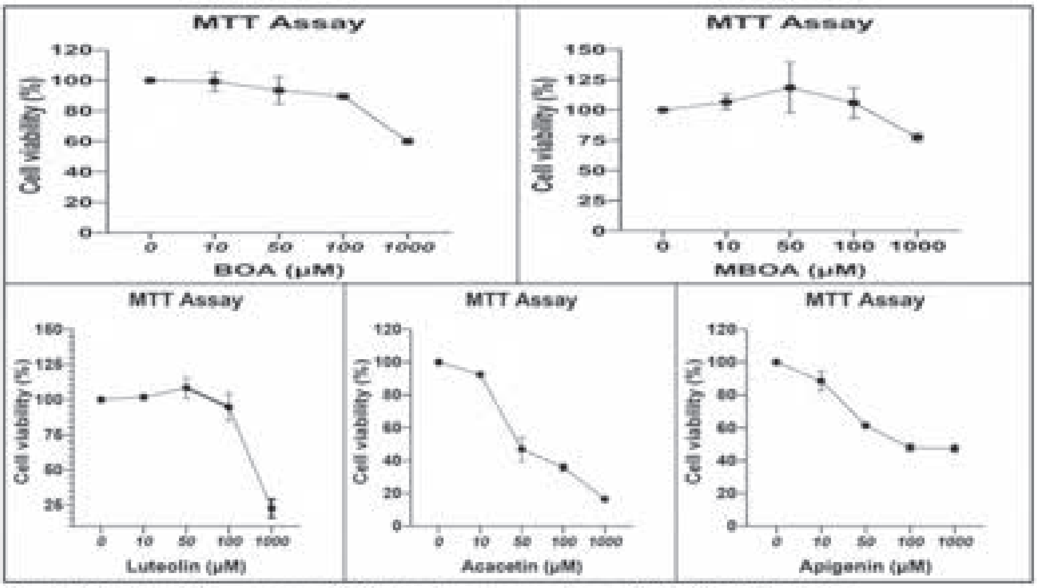


Fig 5: Cytotoxicity assay of Selected compounds on RAW264.7Cell line

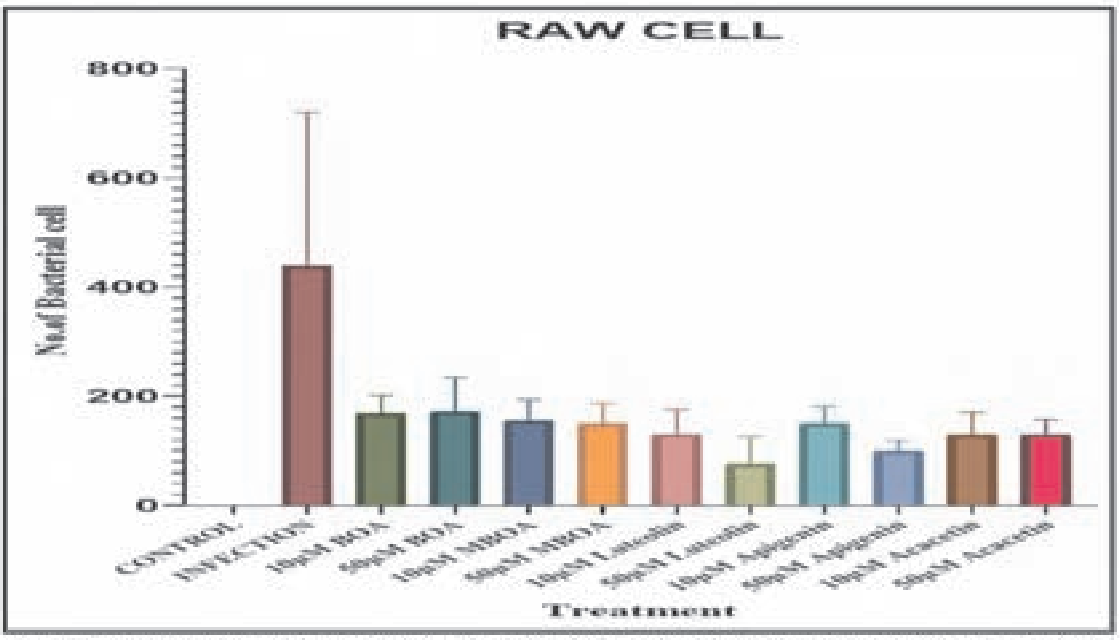


Fig 6: Invasion assay with RAW264.7 Cell line infected with *Salmonella* Typhi and treated with selected compounds.

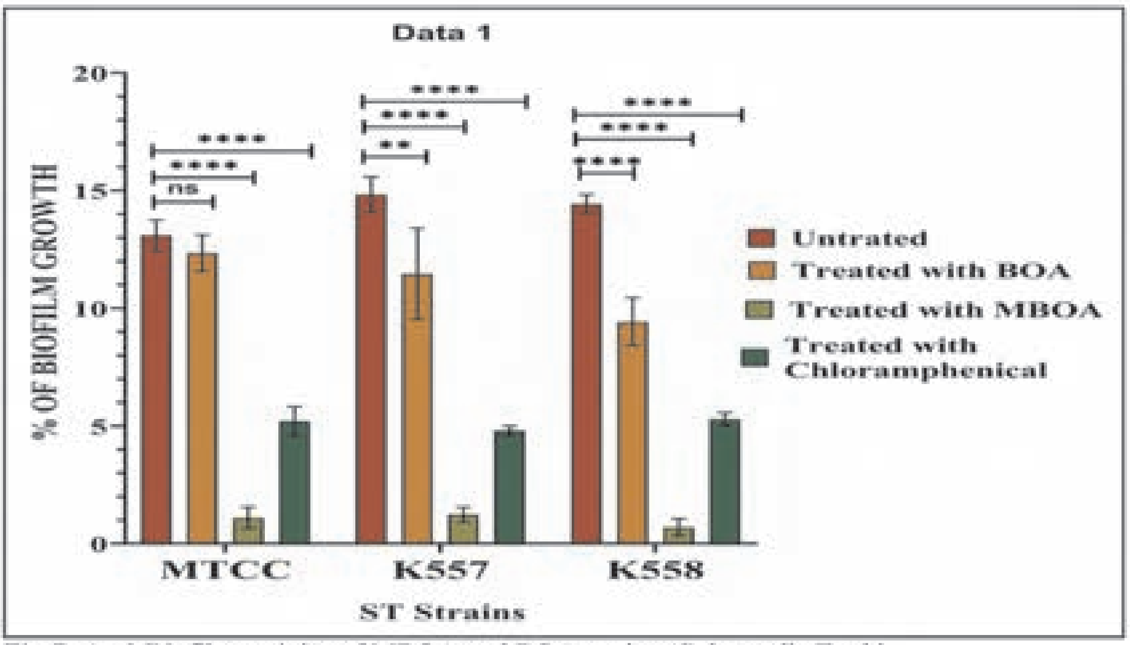


Fig 7: Anti-Biofilm activity of MBOA and BOA against *Salmonella* Typhi.

Molecular characterization of antimicrobial resistant non-typhoidal *Salmonellae* isolated from patients with acute gastroenteritis and evaluating the beneficial role of probiotic and synbiotic against NTS infection.

Name of the Investigator: Dr. Shanta Dutta,
Name of Co-investigator: Paulami Dutta (ICMR-SRF, PhD Student)

Multi-drug resistant (MDR) non-typhoidal *Salmonellae* (NTS) poses significant burden in healthcare system, 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 and elderly population. Over a period of 12 months (Apr'23-Mar'24), we have isolated 12 (**1.71 %**) NTS on screening 700 stool samples and rectal swabs from patients with acute watery diarrhea following standard microbiological methods. We observed *S.* Typhimurium (6/12; 50 %) was predominant followed by *S.* Kentucky (3/12; 25%) (Fig 8).
A high rate of resistance was observed against nalidixic acid, tetracycline and 3[rd] generation cephalosporins (n = 4/12; **33.33%**). One third (**33.33%**) of NTS isolates were **multi-drug resistant** which predominantly included *S.* Kentucky (n=3/12; **25%**) followed by *S.* Typhimurium (n=1/12; 8.33%). Overall, **33.33%** isolates were **pan susceptible**.

Table 3: Phenotypic & Genotypic characters of multi-drug resistant (MDR) NTS faecal isolates in Kolkata during Apr'23 to Mar'24

Serotype	AMR Profile	Detection of AMR gene	Mutations in QRDR
*S.*Kentucky (n=3)	ATeNaCiNoAkCaCtCrAt^R	*blaTEM, blaCTX-M, tetA,*	S83F, D87Y
	ATeNaCiNoCaCtCr^R	*blaTEM, blaCTXM, tetA,*	S83F, S80I
*S.*Typhimurium (n=1)	AQGCaCtAzAm^R	*blaTEM, aadB, sul1*	D87Y

A- Ampicillin, Te- Tetracycline, Na- Nalidixic acid, Q- Sulfamethoxazole/trimethoprim, C- Ciprofloxacin, N- Norfloxacin, G- Gentamicin, Ak- Amikacin, At- Aztreonam, Az- Azithromycin, Ca- Ceftazidime, Cr- Ceftriaxone, Ct- Cefotaxime, Am- Amoxycillin/Clavulanic Acid.

Since multi-drug resistance was found mostly in *S.* Kentucky, we have explored the prophylactic efficacy of probiotic and synbiotic in preventing *S.* Kentucky induced diarrhea in mice model.

The Co-culture assay (Fig. 9) shows significant reduction in growth rate of S. Kentucky in presence of *Lactobacillus* spp.

The number of colonies of *S.* Kentucky in stool culture of infection group and synbiotic fed group were higher as compared to the probiotic fed group. Colonization of *S.* Kentucky in ileum and liver tissue lysate were significantly lower in synbiotic and probiotic fed group (Fig. 10). The prophylactic efficacy of probiotic and synbiotic were further estimated by determining the levels of pro (TNF-α, IFN-γ) and anti-inflammatory (IL-10, IL-6) cytokines in the tissue lysates from different test groups {Fig 11 (a) & (b)}.

Conclusion:

This study informed the molecular characteristics of the common NTS serovars and their AMR profiles, which helped the clinician in formulating appropriate treatment protocol. Additionally, applications of probiotic in combination with prebiotic (inulin) against NTS infection (isolated from clinical samples) indicated a suitable management strategy to combat infection by antimicrobial resistant non-typhoidal *Salmonellae.*

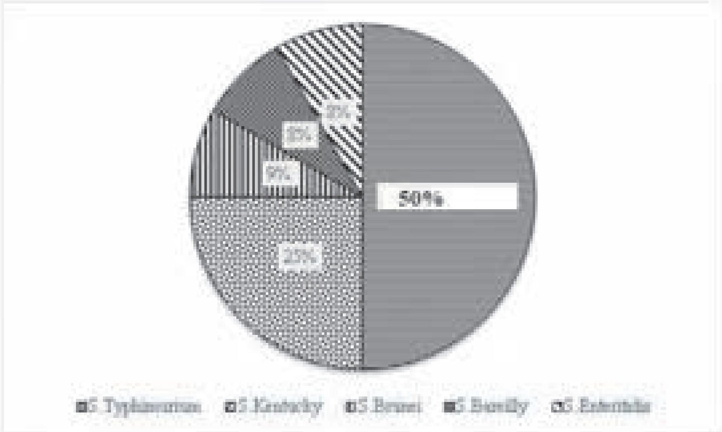


Fig 8: Distribution of NTS, isolated from children ≤5 years of age attending OPD of Dr. B.C.Roy Post Graduate Institute of Paediatric Sciences (n=12) during Apr'23 - Mar'24.

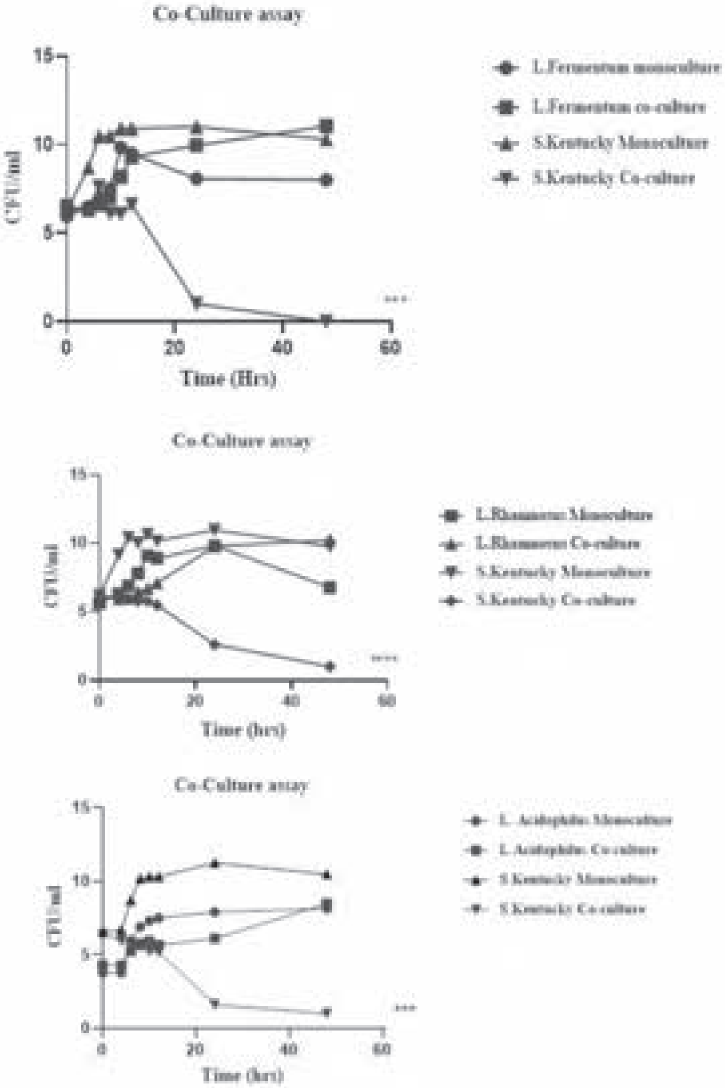


Fig 9: The Co-culture assay shows significant reduction in growth rate of S. Kentucky in presence of Lactobacillus spp.

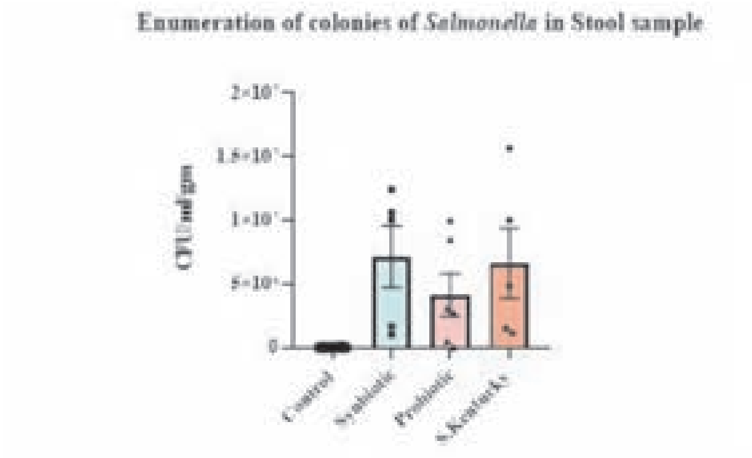


Fig 10. Enumeration of colonies of *S.* Kentucky in stool sample from each test groups.

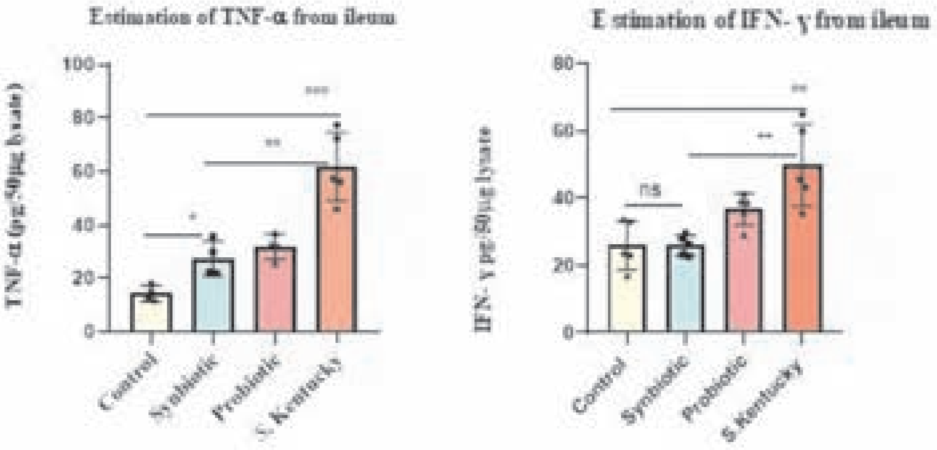


Fig 11 (a). Estimation of pro-inflammatory (TNF-α, IFN-γ) cytokines in issue lysates from each test groups.

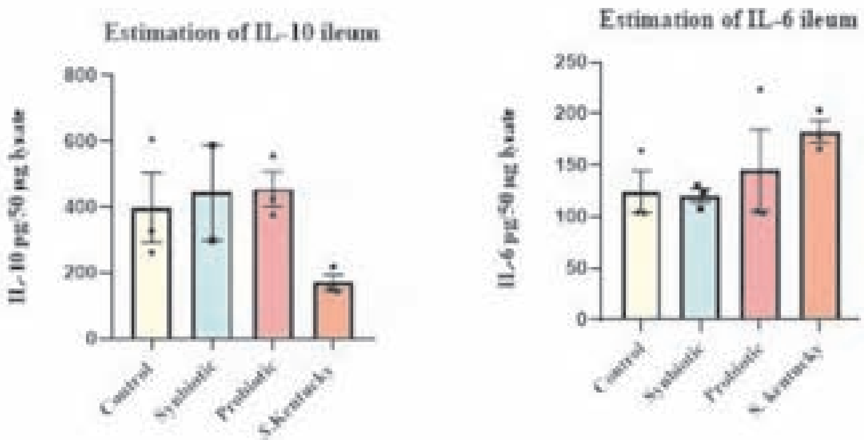


Fig 11 (b). Estimation of anti-inflammatory (IL-10, IL-6) cytokines in issue lysates from each test groups.

Conferences / Seminars /Workshops / Meetings / Trainings Attended

- Director General's meeting with the Directors of ICMR Institutes on 6th April, 2023
- 67th Annual National Conference of the Indian Public Health Association (IPHACON 2023) - Chairing a Plenary Session on "Addressing seasonal Influenza in India" on 7th April, 2023 at Biswa Bangla Convention Centre, New Town, Kolkata
- VC meeting to discuss Mega Tb project with all site PIs, Director ICMR NIRT and Head ECD organized by ICMR on 19th April,2023.
- Invited as an Expert to Review the proposal in the review meeting for the "Capacity Building for Disease Burden Project and Estimation" virtually organized by ICMR on 28/04/2023
- Webinar: Brown Paper on Global Vaccine Research Collaborative (GVRC): A framework for mitigating and preventing future pandemics" co-hosted by G20/T20 on 26/05/2023
- Brainstorming workshop on 'Technology Vision 2047 and Climate Change' organized by IIT-KGP held on 1-2 June, 2023 at IIT Kharagpur
- "Global Vaccine Research Collaborative" co-branded by the Department of Pharmaceuticals, Govt. of India, PATH, and CEPI held in Hyderabad on 3rd June, 2023.
- ICMR Intramural Research and Innovation Meet 2023 held on 23rd June, 2023 at ICMR Hqrs.
- The 10th Annual Meeting of the Global Task Force on Cholera Control (GTFCC) held in hybrid mode from 26-28 June, 2023.
- ICMR-CEPI roundtable on 'Accelerating Vaccine Development: 100-Day Mission to combat future pandemics' on 3rd July, 2023 at ICMR Hqrs.
- Delivered a talk on "The role of medical microbiologists in the implementation and translational research" at the 1st Foundation Day, Dept. of Microbiology and World Hepatitis Day and UG & PG Symposium on 25/07/2023 organized by AIIMS, Kalyani
- Delivered a motivational talk on the prospect of higher education for B.Sc. Microbiology (Honours) newly admitted students of Ramakrishna Mission Vivekananda Centenary College, Rahara, Kolkata on 27th July, 2023 in virtual mode.
- Chief Guest for Annual Science Exhibition of the La Martiniere for Girls School on 4th August, 2023
- 'MRC Advisory Committee' meeting on Establishment of Medical Research Centre (MRC) in the NCR-BSC-Constitution held on 18th August, 2023 at THSTI, New Delhi
- Webinar on **"Scientific Leadership"** by Dr. R Balasubramaniam, Member-Human Resource CBC, a visiting professor at Cornell University, USA and at IIT-Delhi organized by Capacity Building Commission (CBC) on 31 August 2023
- INSPIRE study dissemination meeting and panel discussion titled "Protecting India's Seniors: Role of Influenza vaccinations" held on 13th September, 2023 at The Park Hotel, New Delhi by AIIMS, Delhi
- India-UK AMR Workshop on "Our AMR Research and You" on Wednesday, 13th of September 2023, 2pm – 4:30pm (IST), being hosted by the interdisciplinary UK team of academics from different UK Institutions, including Glasgow Caledonian University, Imperial College London, University of Birmingham, University of Bristol, University of Leeds, University of Warwick, and University of the West of Scotland
- A consultation on "Improving Vaccine Effectiveness Studies: A vital step before the next pandemic" organized by the WHO R&D Blueprint on 14 September 2023
- Webinar on "Intellectual Property for Scientists" by Prof. (Dr.) Unnat Pandit, CGPDTM of India (Controller General of Patents, Designs, and Trade Marks organized by Capacity Building Commission (CBC) on 14th September 2023
- Special Guest at the Multi-international Conferences organized by Swami Vivekananda University, Barrackpore on 28th September, 2023
- Chief Guest & Keynote speaker for the BioNext 2023: Translational Research towards attaining "Good Health & Well Being" organized by the Adamas University, Kolkata held during 4-6th October 2023.
- Webinar on "Government e-Market Place GeM" by Ms. Geetu Bansal organized by Capacity Building Commission (CBC) on 5th October 2023
- 63rd Annual Conference of National Academy of Medical Sciences NAMS-Convocation during October 6th to 8th 2023 (Friday, Saturday & Sunday), at Ramaiah Medical College, Bengaluru
- ICMR-CDSCO Joint Workshop on 'Regulatory Awareness & Experiential Learning for Medical Device/Diagnostic Innovators/Start-ups in India' on 12/10/2023

- Chairing Scientific at the "Indo-US International Conference & Workshop on Antimicrobial Resistance and Human Microbiome" to be held during November 15-16, 2023 at THSTI, Faridabad.
- Okayama University-NIRBI Joint Online Seminar on Diarrheal Research in India on 4th December, 2023 at ICMR-NIRBI
- A High-level Networking Reception to "Promote EU – India S&T co-operation and EU Research & Innovation Initiatives" by The European Union Delegation to India in collaboration with Goethe-Institut, Kolkata on 4 December, 2023 at Goethe-Institut, Park Mansions, Gate 4, 57A, Park Street, Kolkata
- 57th US-Japan Cooperative Medical Science Program – Joint Panel Conference on Cholera and Other Bacterial Enteric Infections to be held during 12-14th December at Kururu Itoman, Okinawa, Japan
- Participation in the "2nd Acharya Prafulla Chandra Roy Smarak Vigyan Mela O Pradarshani" as an eminent panellist in an interactive programme with the students of schools and colleges entitled "Meet the Scientists" held on 6th January, 2024 at the West Bengal University of Animal and Fishery Sciences, Kolkata
- WHO R&D Blueprint "A scientific framework for epidemic and pandemic research preparedness" on 09/01/2024
- NIID and ICMR-NIRBI Joint Bilateral Meeting on the collaborative research projects" at the National Institute of Infectious Diseases (NIID), Tokyo and Okayama, Japan during 15th to 19th January, 2024
- 'Clinical Research Essential' workshop conducted by MRHRU, Darjeeling at Siliguri on 8-9th February, 2024
- Oral Cholera Vaccine Working Group meeting/discussion on research at 6.30 pm on 13/02/2024
- Joining as a distinguished Panelist in the 7th edition of Health Tech Summit 2024 on innovations and disruptions in healthcare and biotechnologies to be organized by The Bengal Chamber of Commerce and Industry (BCC&I) on 1st March 2024 at The Park, Kolkata Session: "Gen AI – Research to Wellness"
- Interactive Discussion on empathy-based individualistic approach to patient care organized by Bengal Chamber of Commerce and Industry and Global Cloud Cayr Pvt. Ltd. on 28th March 2024, 7.30 PM at JW Marriott

Awards/Honours received

- Elected as a Fellow of the National Academy of Medical Science (India) in the year 2023 in recognition of significant contribution for the advancement of Medical Sciences

Patent(s) filed/accepted /Technology developed

Patent title: A trivalent vaccine against Campylobacter jejuni, Salmonella Typhimurium and Salmonella Enteritidis, formulation, and method of preparation thereof
Patent Application No. 202311037297 dated 30/05/2023
Status: Waiting for PCT application through IPR division, ICMR

Patent title: Development of a safe and cost-effective universal Shigella immunogen
Patent Application No. 202311061296 dated 12/09/2023
Status: Waiting for PCT application through IPR division, ICMR

Ph.D. Awarded:

Name: Dr. Priyanka Jain
Thesis Title : Studies on developemonet of antimicrobial resistance in non-typhoidal Salmonella
University: University of Calcutta
Date: 22nd June, 2023

Post & Pre-doctoral Fellows

Post-Doctoral Fellow:

Dr. Deotima Sarkar, ICMR-PDF

Pre-Doctoral Fellow:

Mr. Gaurab Halder, SRF- CSIR

Ms. Sunayana Saren, SRF- UGC

Ms. Paulami Dutta, SRF- ICMR

Ms. Sohini Sikdar, SRF-CSIR

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

Identification of *Vibrio cholerae* O1 by loop-mediated isothermal amplification (LAMP) assay.

Rapid detection of *Vibrio cholerae* O1 and early implementation of mitigation strategies are the two critical factors in curbing the spread of cholera during compromised situations due to natural calamities. Laboratory settings with limited or no supply of diagnostic antisera against O1 and O139 are the limiting factors to identifying culture-confirmed cholera cases. The involvement of cholera-specialized laboratories for culture-confirmed pathogen detection eats up the most valuable time between the first case detection and receipt of the cholera confirmation reports. This is because of the time required for the physical deployment of trained laboratory personnel at the affected place or shipment time of specimens to a specialized laboratory followed by receipt of culture-based analysis and confirmation reports.

A rapid, simple test for identifying *V. cholerae* O1 was developed using a LAMP-based assay. Fig. 12 represents electrophoresis patterns of the LAMP-amplified DNA specific to *V. cholerae* O1 with a detection limit. Analysis showed that the assay was specific to *V. cholerae* O1 (Table 4).

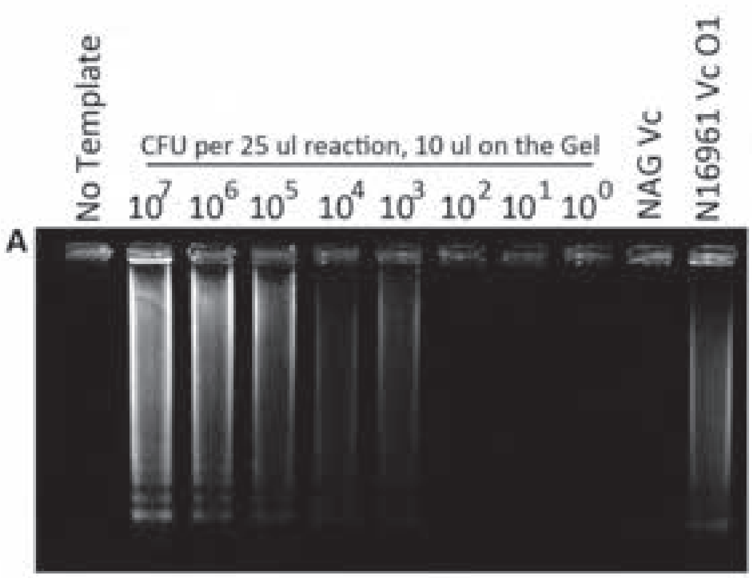


Fig 12: Agarose gel electrophoresis patterns of LAMP-amplified DNA from *V. cholerae* O1 show a detection limit of 10^3 cells per reaction.

Table 4: LAMP assay-based specific detection of *V. cholerae* O1 using pure culture

Organisms	No. of strains tested	LAMP Assay Positive
V. cholerae O1	33	+
V. cholerae O139	10	-
V. cholerae non-O1, non-O139	22	-
V. parahaemolyticus	11	-
Salmonella sp.	05	-
Shigella sp.	05	-
Diarrheagenic E. coli	05	-
Aeromonas sp.	05	-

Taking the lead from the above outcomes, an intramural project was undertaken to modify the assay to interpret the data using a mobile phone-augmented device so that interpretation remains free from user bias and suitable for performance in a healthcare setting with minimal facilities.

Comparative assessment of safety and Immunogenicity of Euvichol-Plus vs. Shanchol among volunteers in India: a regulatory trial.

This regulatory trial assessed the comparative immunogenicity and safety of Oral Cholera Vaccines (OCV) Euvichol-Plus with Shanchol in healthy Indian adults and children. The officer reported upon, completed laboratory analysis, and analyzed vibriocidal data from the sera collected from the volunteers who participated in the study across seven sites in India.

This study was performed in a non-inferiority trial design to evaluate the new vaccine Euvichol-plus against Shanchol. It is pertinent to mention here that Sanofi Pasteur, the manufacturer of Shanchol, announced it would stop production in 2023. Therefore, a safe and effective OCV was in demand in India.
Data generated from this study has established that Euvichol-Plus was non-inferior to Shanchol. Table 5 shows participants with ≥4-fold increase with Euvichol-Plus and Shanchol, 2 weeks after the 1st dose administered. The data has been published in Lancet Reg Health, Southeast Asia. 2023:19:100256. All these works contributed towards the licensure of Euvichol-Plus use in India.

Table 5: A similar extent of vaccine-induced immune responses among the volunteers of the Euvichol-Plus and the Shanchol arms with a rise of ≥4-fold vibriocidal titer following 2 weeks interval from the first dose.

Antibody	Euvichol-Plus (N = 206), n (%), [95% CI]	Shanchol (N = 208), n (%), [95% CI]	p-value
O1 Ogawa	159 (77.18%), [70.84, 82.73]	148 (71.15%), [64.48, 77.21]	0.1611
O1 Inaba	151 (73.30%), [66.71, 79.21]	156 (75.00%), [68.54, 80.73]	0.6930
O139	124 (60.19%), [53.16, 66.93]	124 (59.62%), [52.61, 66.34]	0.9044

Conferences / Seminars /Workshops / Meetings / Trainings Attended

- Acted as an organizing member to arrange a talk, "Sundarbans, Climate Crisis and Emerging Diseases," at the Seminar Room, NIRBI-II building, on World Environment Day. On June 5, 2023. Most of the staff members of ICMR-NIRBI attended the talk.
- Participated in a Workshop on ChatGPT under the Capacity Building Commission (online) on August 22, 2023; organized by ICMR.
- Joined the Stakeholders' Meeting of the Food and Food Processing Sector on SNAP 2022-27 (online) on August 23, 2023; organized by the Bureau of Indian Standard.
- Joined the Technical Committee Meeting of Drinking Water and Carbonated Beverages Sectional Committee, FAD 14 (Online) on August 25, 2023; organized by the Bureau of Indian Standard.
- Participated in a Webinar on 'Scientific Leadership' under the Capacity Building Commission (CBC) (online); organized by ICMR.
- Partcipated in a Webinar on 'Intellectual Property for Scientists' under the Capacity Building Commission (CBC) (online) on September 14, 2023; organized by ICMR
- Partcipated in a Webinar on 'GeM' under the Capacity Building Commission (CBC) (online) on October 5, 2023; organized by ICMR

- Participated in a Webinar on 'Science Communication for Scientists' under the Capacity Building Commission (CBC) (online) on October 19, 2023; organized by ICMR
- Oral presentation '*Vibrio cholerae* non-metabolizable sugar arabinose inhibits *in vitro* growth: therapeutic potential in the treatment of cholera' at the 57th United States-Japan Cooperative Medical Science Program (USJCMSP)-Joint Panel Conference on Cholera and Other Bacterial Enteric Infections, Okinawa, Japan during December 12-14, 2023. Experts in the cholera field across the globe attended the meeting.
- Joined the Technical Committee Meeting of Drinking Water and Carbonated Beverages Sectional Committee, FAD 14 (Online) on February 23, 2024; organized by the Bureau of Indian Standard.
- Participated in a Webinar on "Understanding the role of social media in scientific and research communication" (online) on March 7, 2024; organized by ICMR

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

Studies on the protective efficacy of fish oil nanoemulsion against non-typhoidal Salmonella-mediated mucosal inflammation and loss of barrier function

Non-typhoidal Salmonella serotypes are well adapted to utilize the inflammation for colonization in the mammalian gut mucosa and cause loss of the integrity of the epithelial barrier in the mammalian intestine. Our study demonstrated the potential utilization of ω-3 polyunsaturated fatty acid (ω-3PUFA) rich fish oil (FO) loaded nanoemulsion [FO-NE] to achieve significant protection against acute intestinal inflammation, which protects the barrier function of the intestinal mucosa against invasion by invasive non-typhoidal Salmonella (iNTS).

Molecular Analysis of NDM-5 Carbapenemase-Encoding Gene (*bla*$_{NDM-5}$) -Positive Multidrug Resistant Commensal *Escherichia coli* from Diarrheal Patients

The emergence and spread of carbapenem-resistant Enterobacteriaceae is a critical concern worldwide. To the best of our knowledge, this is the first report on carbapenem resistance involving the *bla*$_{NDM-5}$ gene in Commensal *Escherichia coli* (CE) from diarrheal patients. The circulation of *bla*$_{NDM-5}$ gene in CE is worrisome since it has the potential to transfer this gene to other enteric pathogens.

Exploring the effect of the number of TTTTGAT heptamer repeats in cholera toxin promoter activity in *Vibrio cholerae* O1

A complex virulence regulatory cascade controls the expression of the cholera toxin genes (*ctxAB*) in *Vibrio cholerae*. The cholera toxin promoter (P*ctxAB*) contains a series of heptad repeats (5′-TTTTGAT-3′); which recruit the transcriptional regulators ToxT, ToxR, H-NS. The number of these repeats varies among *V. cholerae* O1 pandemic strains. The result of this study demonstrated that P*ctxAB* activation inversely correlates with the number of heptad repeats. And distal heptad repeats participate in stronger H-NS binding and P*ctxAB* repression. Further, ToxT-mediated transcriptional activation of P*ctxAB* does not require entire H-NS displacement.

Development of a culture-independent nested PCR-based assay for rapid detection of clarithromycin-resistant *Helicobacter pylori*

Eradication of *Helicobacter pylori* provides the most effective treatment for gastroduodenal diseases caused by *H. pylori* infection. Clarithromycin still remains the most important antibiotic used in *H. pylori* eradication treatment. But the increasing prevalence of clarithromycin-resistant *H. pylori* strains poses a great threat to eradication therapy. Due to the non-availability of quick detection of antimicrobial profile against *H. pylori* (the culture-based method takes 2-3 weeks' time in the laboratory and still no diagnostic laboratory does not perform this test in India), the empirical treatment is the only option for the Indian clinicians. Recently, we have developed a low-cost nested PCR assay directly from the biopsy samples for the rapid detection of clarithromycin sensitive and resistant strains, providing rapid initiation of effective antibiotic treatment.

Altered molecular attributes and antimicrobial resistance patterns of *Vibrio cholerae* O1 El Tor strains in India

The global spread of cholera still remains a major public health concern in several countries. This study showed hypervirulent, polymyxin B-sensitive epidemic-causing *Vibrio cholerae* strains in India along with the strains with polymyxin B-resistant and non-hemolytic traits that may spread and cause serious disease outcomes in the future. Special attention is also needed for the monitoring of antimicrobial resistance surveillance because *V. cholerae* strains are losing susceptibility to many antibiotics used as a second line of defence in the treatment of cholera.

Conferences / Seminars /Workshops / Meetings / Trainings Attended

	Conference/Seminar Name of	Title of Paper presented (if any)	Country	Conference/Seminar Attended	Period from	Period to
•	Exploring the Bioresources of India to fight against Antimicrobial Resistance (AMR)	Carbapenem Resistance in clinical *Vibrio cholerae* O1 strains: A Challenge to Modern Medicine	India	National	04-Apr-2024	05-Apr-2024
•	57th US-Japan Joint Panel Conference on Cholera and Other Bacterial Enteric Infections	Contemporary vicissitudes in the ctxB and tcpA genes of El Tor vibrios display increased virulence and cholera epidemics	Japan	International	12-Dec-2023	14-Dec-2023

PhD Awarded

Name	Dr. Sreeja Shaw
Title of the thesis	Molecular evaluation of *Vibrio cholerae* O1 strains in India to decipher the mechanism of higher virulence and antimicrobial resistance
Date of Award	05.04.2024
Name	Dr. Debjani Ghosh
Title of the thesis	A comperative study of virulence factor of antibiotic susceptibility pattern of enteric *Escherichia coli* isolated from diarrheal patients
Date of Award	13.05.2024
Name	Dr. Sangita Paul
Title of the thesis	Genetic Attributes And Drug Resistance of *Helicobacter pylori* Isolated From Different Regions Of India And Their Involvement In Disease Manifestation
Date of Award	07.06.2024
Name	Bipul Chandra Karmakar
Title of the thesis	Studies on plasticity region genes and drug resistance in *Helicobacter pylori* strains isolated from patients with different clinical outcomes in India
Date of Award	08.07.2024

Post and Pre-Doctoral Fellows :

Pre-Doctoral Fellows:
Ms. Debolina Roy, SRF-UGC
Mr. Nirupam Roy, JRF-UGC
Ms. Puja Bose, SRF-Project
Ms. Samhati Bhakta, JRF-UGC
Mr. Arindam Mukherjee, JRF-UGC

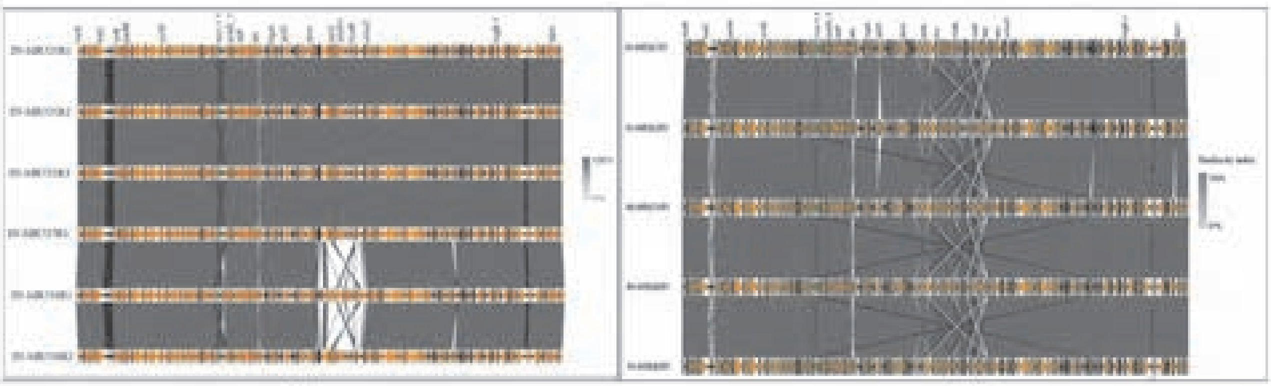
S. Basu (Principal Investigator), Bacteriology Division

Emergence of carbapenem-resistant *Acinetobacter pittii* of novel sequence type (ST1451) isolated from septicaemic neonate

Acinetobacter baumannii is the major organism causing infections in hospitalised patients. However, *Acinetobacter pittii*, a non-baumannii, are increasingly recognized as a clinically relevant organism causing infections. Presence of carbapenem-resistant *A. pittii* has been reported worldwide. This study for the first time reported presence of two *A. pittii* co-harbouring bla_{NDM-1} & bla_{OXA-58} belonging to novel sequence type, ST1451. The isolates showed high biofilm production, serum resistance, growth under iron limiting condition, surface-associated motility, adherence to host cell, cytokine production in host cell and mortality in mice indicating its increased pathogenicity. Hence, emergence of multidrug-resistant *A. pittii* calls for surveillance and further investigation of its pathogenic potential.

Carriage and transmission of colistin resistance gene, *mcr* in rectal specimen

Emergence of transmissible colistin resistance gene, *mcr*, has made colistin (last resort drug to treat carbapenem-resistant infections) ineffective. A study was conducted to evaluate the carriage and transmission dynamics of *mcr* among pregnant mothers and neonates. *mcr* was found only in healthy maternal gut (0.9%) and not in neonates. Two routes of transmission of *mcr-1.1* was noted- clonal spread and plasmid-mediated spread. *mcr-1.1*-bearing IncHI2 plasmid exhibited similarities in sequences across the study strains (Fig. 13). This is the first study to highlight within-host diversity of *mcr-1.1*-harbouring *E. coli*. The presence of *mcr-1.1* in *E. coli* of healthy individuals is worrisome and may serve as a focal point for the spread of colistin resistance within community.



(a) (b)

Fig. 13: Alignment of *mcr-1.1*-bearing IncHI2 plasmid sequences of the study isolates exhibiting sequence similarities. (a) ~216 kb, (b) ~240 kb. Yellow ochre-coloured arrows: different genes, green arrow: *mcr-1.1*. Shaded regions: percentage similarities.

Conferences / Seminars /Workshops / Meetings / Trainings Attended

- **46th Annual Conference of Indian Association of Medical Microbiologists (MICROCON)** Lucknow, India. 23-26th November, 2023. Identification and characterization of carbapenem-resistant hypervirulent *Klebsiella pneumoniae* from a tertiary care hospital in North-East India- Poster presentation by student.

- **46th Annual Conference of Indian Association of Medical Microbiologists, (MICROCON)** Lucknow. 23-26th November, 2023. Transmission of Gram-negative Enterobacteriaceae from mother to baby- Poster presentation by student.

- **92nd Annual Meeting of the Society of Biological Chemists (India),** Goa, India, 18-20th December, 2023**.** Detection of various CRISPR-Cas systems and associating beta-lactam resistance in *Klebsiella pneumoniae*- Poster presentation by student.

- **BioNEXT 2023, Adamas University, 4-6th September 2023.** Understanding the nuances of colistin resistance in *Klebsiella pneumoniae*: experience from a neonatal unit- Invited talk

- **Antimicrobial Resistance- Science for Policy, IISER Kolkata, 11th January 2024**. Mobile genes in the maternal and neonatal gut: the *mcr* story- Invited talk.

- **JIS University. 2023**. Antibiotic resistance: The past, PRESENT and future- Invited talk

- **ICMR-Health Communication Course 2022-2023** – November, 2022- April, 2024 organised by MICA, ICMR and Global Health Strategies. Best Poster award and 4th Best Health Communicator Award

Awards/Honours received:

- **Best Poster award and 4th Best Health Communicator Award** at ICMR-Health Communication Course 2022-2023– November, 2022- April, 2024 organised by MICA, ICMR and Global Health Strategies.

Ph.D. Awarded

Name	:	Dr. Subhankar Mukherjee
Title of the thesis	:	A Study On Virulence and Carbapenem Resistance In *Klebsiella pneumoniae* Isolated From Septicemic Neonates
University	:	University of Calcutta
Date of degree	:	4th March 2024

Post and Pre-Doctoral Fellows:

Post-Doctoral Fellow:
Dr. Sharmi Naha, Research Associate-I
Pre-Doctoral Fellow:
Ms. Amrita Bhattacharya, SRF-ICMR
Ms. Priyanka Basak, SRF-ICMR
Mr. Ankur Rao, SRF-ICMR
Ms. Tanusree Das, SRF-UGC
Ms. Deblina Nath, JRF-UGC

H. Koley (Principal Investigator), Bacteriology Division

Establishment of an intragastric surgical model using C57BL/6 mice to study the vaccine efficacy of OMV-based immunogens against *Helicobacter pylori*

Sanjib Das, Hemanta Koley, Asish K Mukhopadhyay

Chronic gastritis is one of the major symptoms of gastro-duodenal disorders typically induced by *Helicobacter pylori* (*H. pylori*). To date, no suitable model is available to study pathophysiology and therapeutic measures accurately. Here, we have presented a successful surgical infection model of *H. pylori*-induced gastritis in C57BL/6 mice that resembles features similar to human infection. The proposed model does not require any preparatory treatment other than surgical intervention. C57BL/6 mice were injected with wild-type SS1 (Sydney strain 1, reference strain) directly into the stomach. Seven days post infection, infected animals showed alterations in cytokine responses along with inflammatory cell infiltration in the lamina propria, depicting a prominent inflammatory response due to infection. To understand the immunogenicity and protective efficacy, the mice were immunized with outer membrane vesicles (OMVs) isolated from an indigenous strain with putative virulence factors of *H. pylori* [A61C (1), *cag+/vacA s1m1*]. In contrast to the non-immunized cohort, the OMV-immunized cohort showed a gradual increase in serum immunoglobulin(s) levels on the 35th day after the first immunization. This conferred protective immunity against subsequent challenge with the reference strain (SS1). Direct inoculation of *H. pylori* into the stomach influenced infection in a short time and, more importantly, in a dose-dependent manner, indicating the usefulness of the developed model for pathophysiology, therapeutic and prophylactic studies

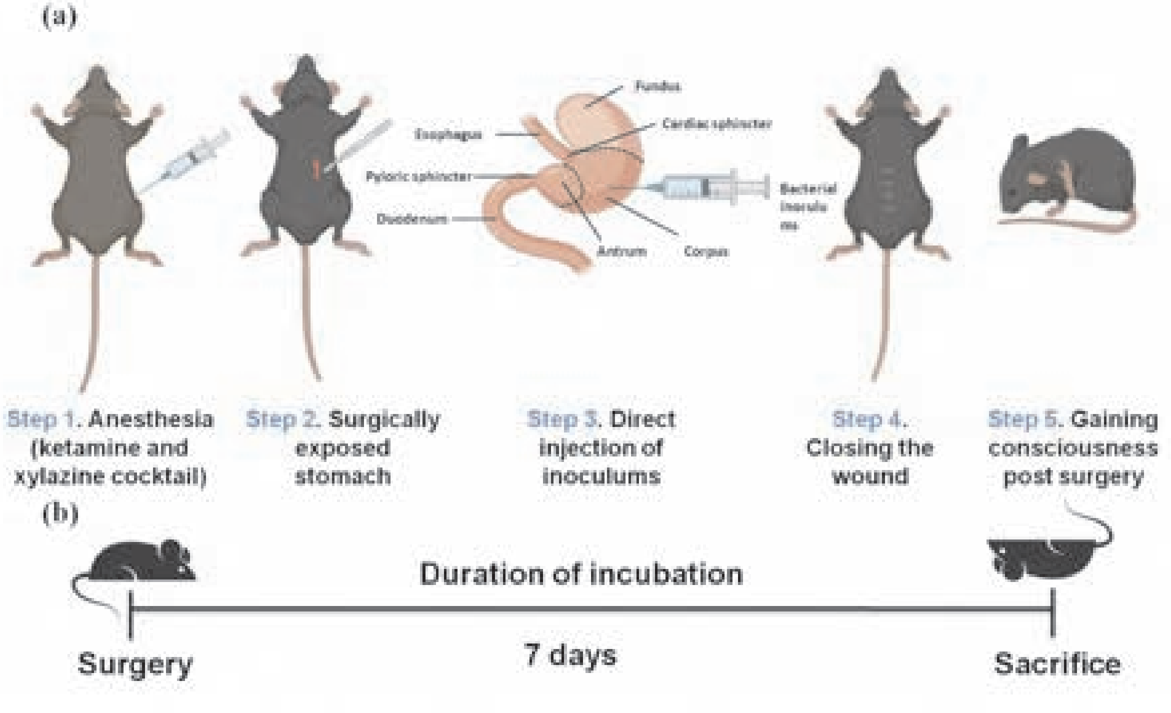


Fig 14: Schematic diagram of the intragastrically infection model in C57BL/6 mice. (a) Graphical Representation of the "Surgical Model" using C57BL/6.Bacterial inoculation (~$2x10^8$CFU/mL) is directly injected into multiple sites of the stomach, **(b)** Schematic schedule from infection to sacrifice

For immunological studies, the remaining 18 mice were separated into two groups as: non-immunized (NI) (n=6) and oral or i.p. immunized (IM) (n=6 in each group). An oral or intraperitoneal immunization with 50 µg of OMVs dissolved in PBS was administered on days 0, 14, and 28. Blood was collected at different time points, and the serum was isolated and stored at -20°C for use in different immunological assays. For the protective efficacy study, both groups (IM and NI) were infected surgically on the 35th day post-first immunization and sacrificed 7 days post-infection.

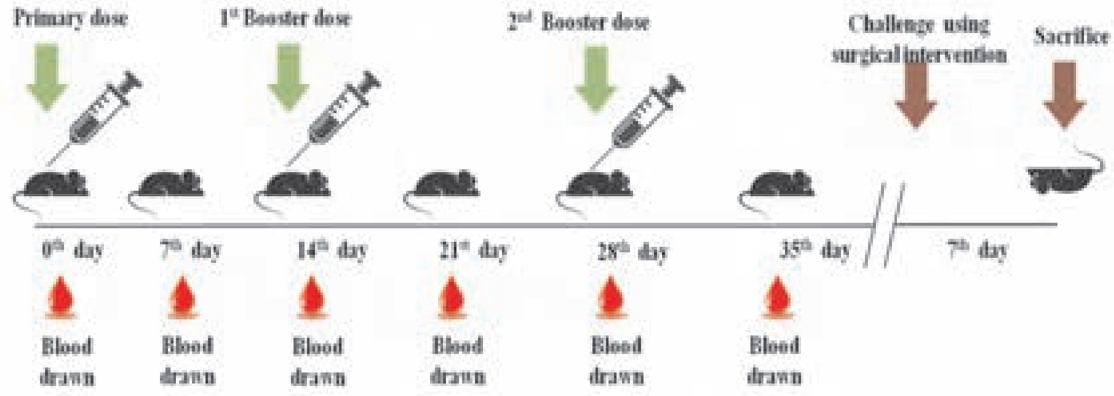


Fig15: Immunization and blood collection schedule Oral or Intraperitoneal (i.p.) route of immunization

After immunization with OMVs, the immunized and non-immunized animals were challenged with wild type SS1 with a dose mentioned before (i.e. $2x10^8$ CFU) and the colonization were analyzed. 7 days post infection. A significant decrease in colonization was observed in the stomach tissue of immunized and non-immunized animals indicating a substantial reduction in bacterial load. To confirm further, DNA was extracted from the gastric tissue and subjected to *ureB* PCR for the presence of *H. pylori.* All non-immunized mice were found to be positive whereas immunized animals were found negative for *H. pylori* depicting insignificant presence of bacterial DNA among OMVs immunized animals. Histopathological changes of both immunized and non-immunized mice stomachs were analyzed 7 days post infection using surgical intervention. OMVs immunized mice showed a significant reduction in gastric epithelial damage, altered gastric mucosa, inflammatory infiltration, exposed gastric pit, and metaplasia. Pathological scores were also less in immunized mice than non-immunized mice. Overall, reductions in bacterial numbers were observed upon immunization.

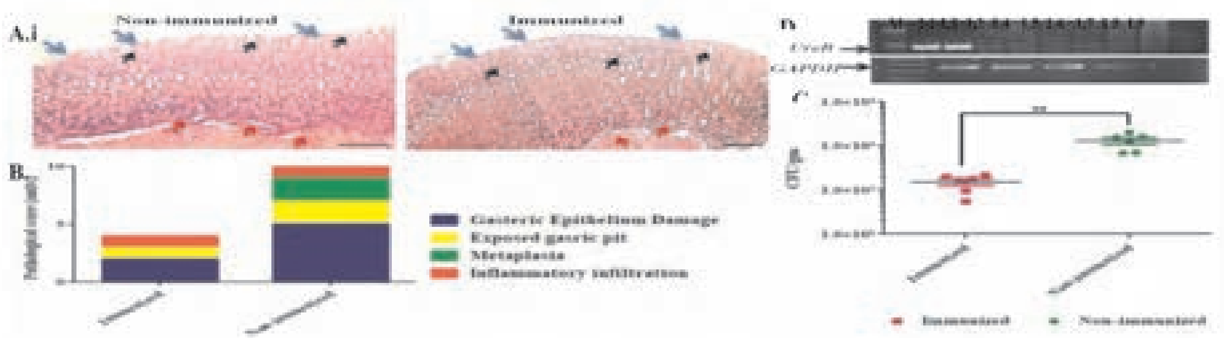


Fig 16:. OMVs immunized mice shows reduced gastric tissue damage, inflammation after infection with SS1 (2 x 10^8 CFU) and reduce bacterial colonization in gastric tissue. Histological images represent both **(A.i)** non-immunized antrum of stomach and **(A.ii)** immunized antrum of stomachs. OMVs immunized mice showed mild epithelial layer damage, less altered gastric mucosa and inflammatory infiltration, whereas non-immunized mice displayed marked epithelial layer damage, inflammatory infiltration, exposed gastric pit and early signs of gastric metaplasia. (Blue arrow: gastric epithelium; Black arrow: exposed gastric pit; Red arrow: Inflammatory infiltration) **(B)** Pathological scores of immunized or non-immunized mice gastric tissue; antrum post *Helicobacter pylori*, SS1 challenge. **(C)** *Helicobacter pylori* colonization in gastric tissue of immunized and nonimmunized mice, **(D)** Tissue DNA extraction and PCR amplification of ureB gene isolated from both non-immunized (**L3, L4, L5, L6**) and immunized (**L7, L8**) mice, **L1, L2** positive control (only bacteria), **L9** negative control, **M:** 100bp ladder. **GAPDH** represents as housekeeping control.

Conferences/ Seminars/Trainings attended/ organized

	Organised by	From	To
• Certificate of completion Prevention of Sexual Harrasement of Women in Work place	Dept of Personal training	16th March 2023	16th March 2023
• Certificate of completion Code of Conduct for Govt Employee	Dept of Personal training	5th April 2023	5th April 2023
• "Sri Ramendra Sundar Sinha Memorial Oration" (2022), The Physiological Society of India held during 3 to 5th March, 2023 at Vidyasagar University.	The Physiological Society of India	03th March 2023	5th March, 2023
• "Key Note Speaker" "Drug Discovery and Development for Infectious Diseases: 3rd and 4th March, 2023.	Eminent College of Pharmaceutical Technology, Jadavpur University.	3rd March, 2023	4th March, 2023

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

" Nanoparticles Electroporated Outer Membrane Vesicles- based antigen (TINEOMVs)". We are pleased to inform you that the complete patent application has been filed on 30/05/2023 for this invention and the patent application number assigned is 202311037297.

Post and Pre-doctoral Fellows

Pre-doctoral students:

Mr. Soumalya Banerjee, SRF-UGC
Mr. Sanjib Das, SRF-UGC
Mr. Arindam Mukherjee, JRF-UGC

S. Bhattacharya (Principal Investigator), Biochemistry Division

Targeting *Shigella flexneri* host pathogen interaction by a herbal compound.

The increasing trend of resistance in *Shigella spp*. to conventional antibiotics poses a threat for treatment of shigellosis. In this regard, there is an urgent need for alternative therapeutics or antibacterial agents. In addition to antibiotic resistance, the pathogen has evolved strategies to subvert host defense mechanisms. Natural products with diverse antibacterial properties are utilized in traditional medicine for gastrointestinal ailments, suggesting their potential in boosting host protective mechanisms. Antimicrobial peptides (AMPs), crucial in maintaining host cell homeostasis, are often suppressed by pathogens, impairing their bactericidal activities. This study largely focuses on screening and identifying herbal compounds capable of inducing AMPs to combat *S. flexneri* infection and elucidate the mechanism behind host-pathogen interplay. Notably, Asiatic acid derived from *Centella asiatica* demonstrates antibacterial effects against *S. flexneri* by up-regulating the expression of antimicrobial peptide genes. (Fig 17, Fig 18, Fig 19, Fig 20)

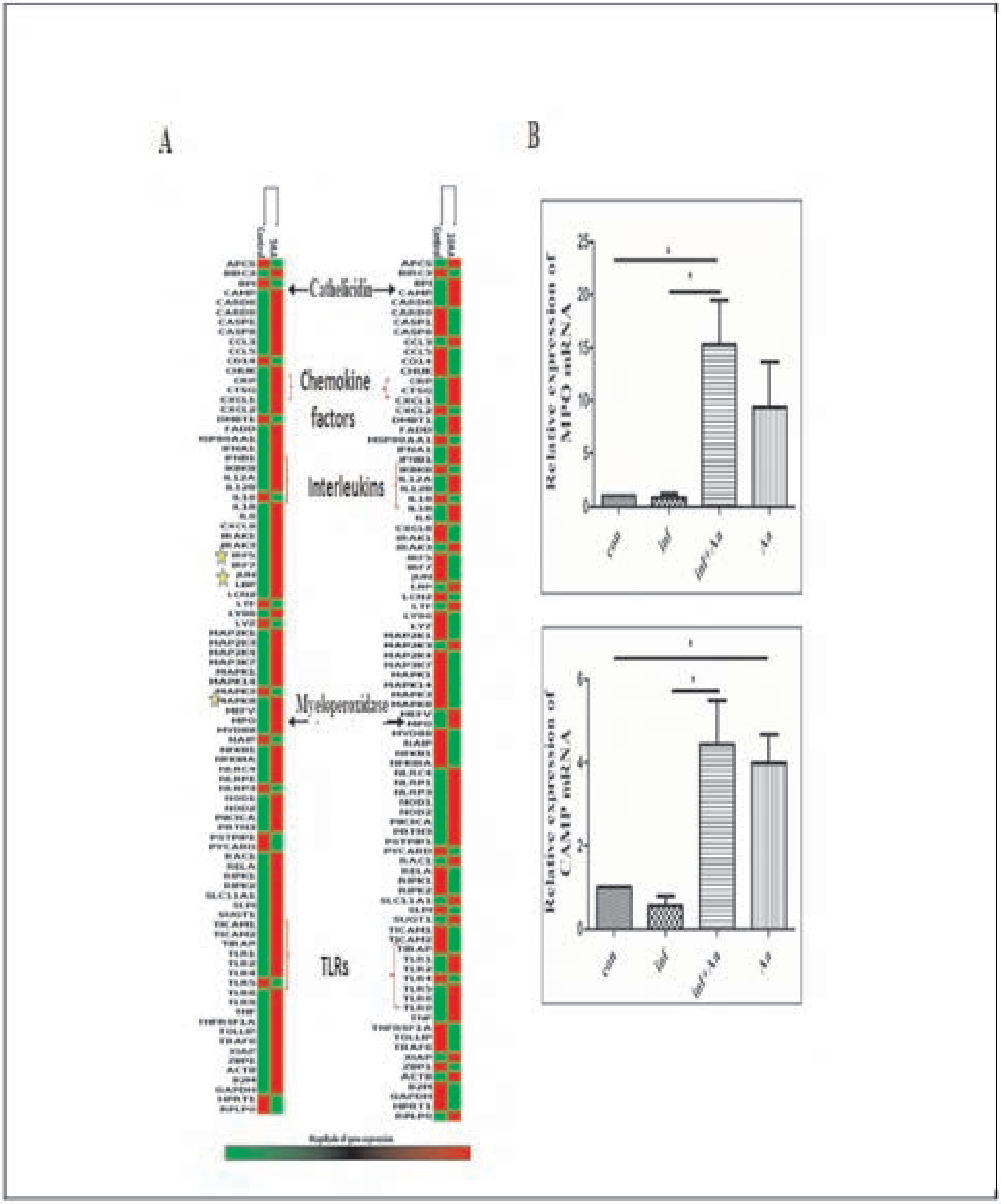


Fig17: Asiatic acid(Aa) activates antimicrobial response gene expression in HT29 cells. Quantitative real-time PCR was performed following Asiatic acid treatment (10 µg ml −1) and bacterial infection (MOI 100) to evaluate the expression of antimicrobial peptides (B) myeloperoxidase (MPO) and cathelicidin (CAMP) in control, infected, infected plus Aa, and Aa treated cells.

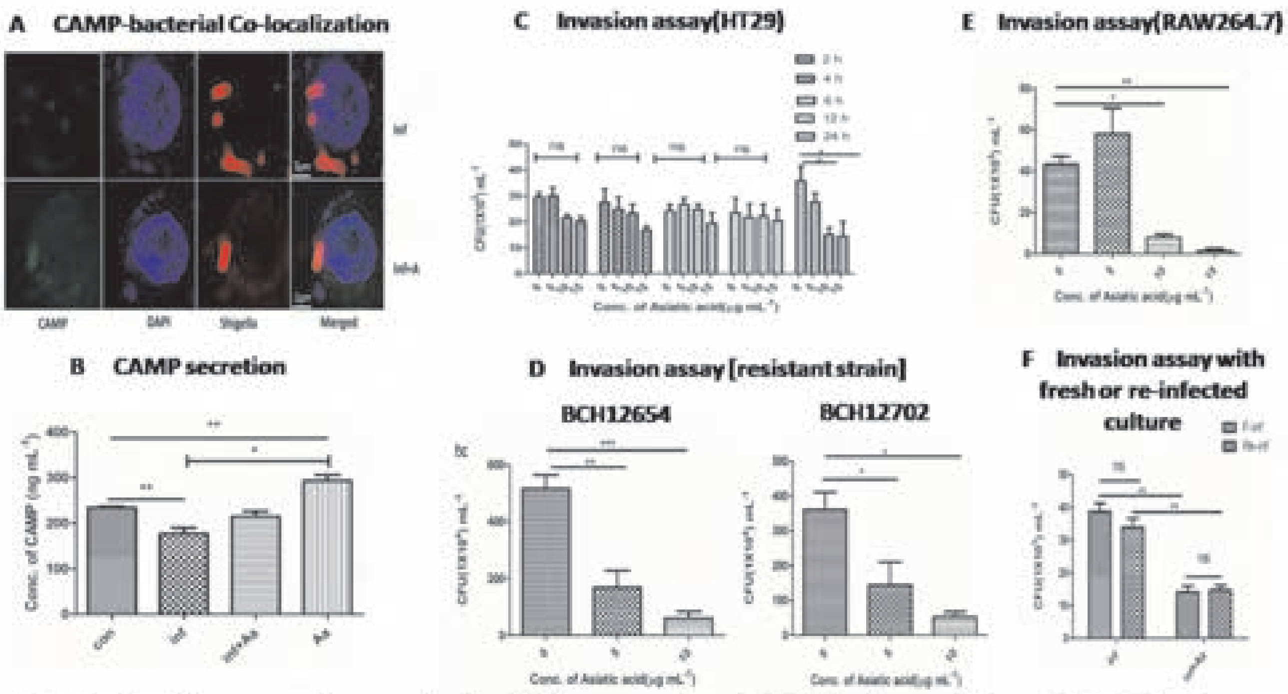


Fig 18: Asiatic acid treatment increased cathelicidin expression and inhibited bacterial growth. Confocal microscopic images of HT29 cells showed an increase in the co-localization of *S. flexneri* (red) with cathelicidin (green). Asiatic acid treatment prevented intracellular growth of *S. flexneri* in intestinal and macrophage cells.

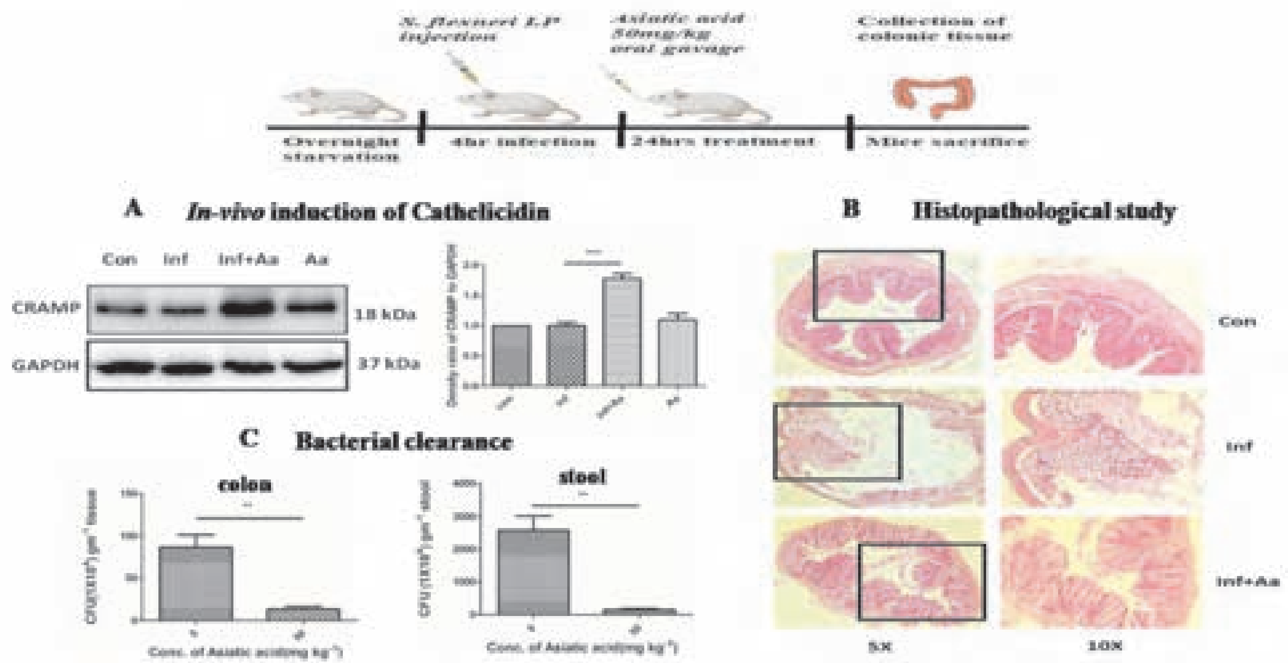


Fig 19: Asiatic acid ameliorated *S. flexneri* infection in *in vivo*. Infected mice were treated with Asiatic acid for 24 h. *Shigella flexneri* infection causes overall colonic tissue damages and reduced the release of cathelicidin. However, Asiatic acid (Aa) treatment ameliorates the effects of *S. flexneri* infection significantly.

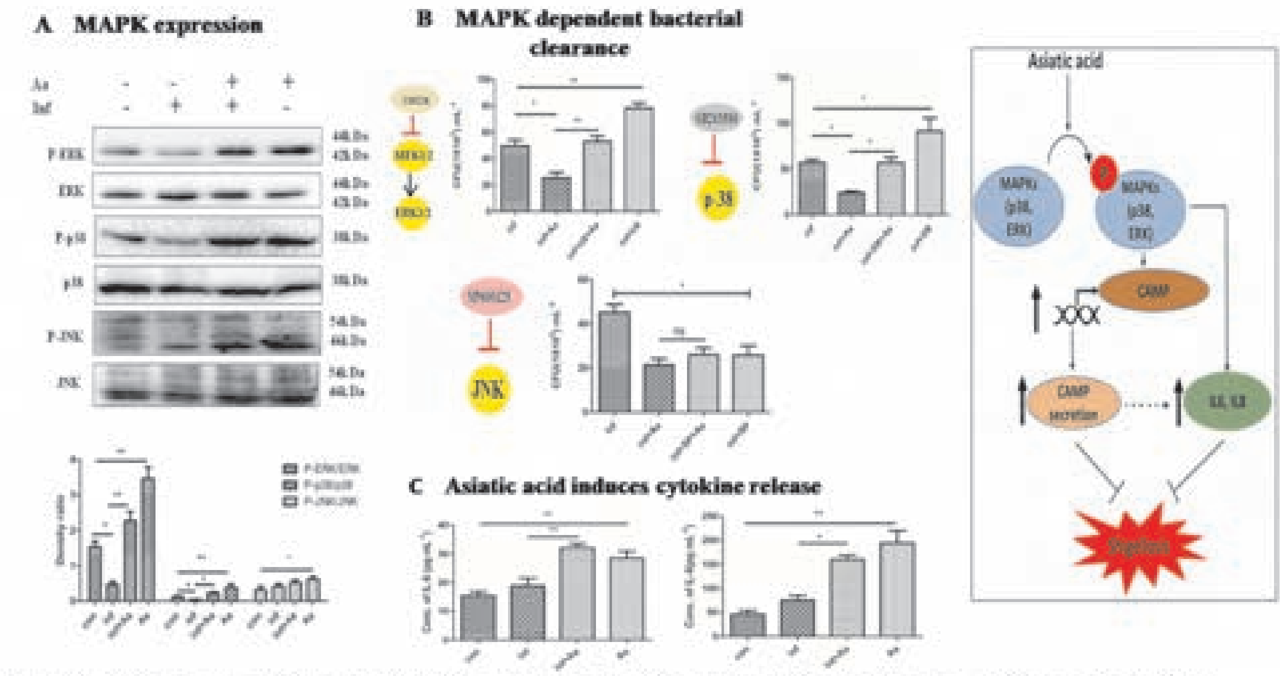


Fig 20: Asiatic acid activates the MAPK pathway and inflammation in HT29 cells. Asiatic acid activates MAPK pathway to induce antimicrobial peptide production and inflammation which eventually reduces bacterial growth.

Conferences / Seminars /Workshops / Meetings / Training Attended

- Attended Capacity Building in Systematic Review at Kolkata organized by ICMR NIRBI in collaboration with WHO from 11th-14th July 2023

- Delivered an invited lecture at the National Seminar on Recent Advances in Animal Science RAASVB-2024
  Conference Title: Inhibition of HMGB1 (High Mobility group Box1) reduces *Helicobacter pylori* infection by inducing autophagy organized by Visva-Bharati University from 7th-8th March 2024

Students awarded Ph.D.

Name	:	Dr. Priyanka Basak
Title of the thesis	:	Therapeutic intervention of *Shigella flexneri* host pathogen interaction
University	:	Jadavpur University
Date of degree	:	8th February 2024

Post and Pre-doctoral Fellows

Pre-Doctoral Fellow
Ms. Priyanka Maitra, SRF-CSIR
Ms. Sushmita Kundu, SRF-UGC
Mr. Sourin Alu, JRF-UGC
Mr. Abhishek Singh, JRF-CSIR

S. Basak (Principal Investigator), Bioinformatics Division

Computational molecular modelling and interaction study between ACE2 receptor from diverse Indian human genome with the spike protein variants of SARS-CoV-2

A deeper understanding of, how genetic variations in ACE2 pose effect on SARS-COV-2 infection might contribute to the development of effective treatments and preventive measures. This study aims to elucidate the interaction dynamics between ACE2 protein variants and the spike proteins of key SARS-CoV-2 Variants of Concern (VOCs), offering insights into population-specific disease susceptibility. We investigated the binding affinities between ACE2 variants and the spike proteins SARS-CoV-2 variants. Our research revealed a significantly higher binding affinity of the Omicron variant's spike protein with ACE2 receptors compared to other variants. This observation provides a molecular-level explanation for the differential transmissibility and infection rates observed with these variants and selective evolutionary adaptation of the virus; enhancing its infectivity and potential implications for varying clinical manifestations. The differential binding affinities observed in the present study, underscore the importance of genomic surveillance of both the virus and host receptor variants. This knowledge is crucial for predicting future trends in the pandemic, tailoring public health responses, and guiding the development of targeted treatments and vaccines.

Evolutionary divergence of TLR9 through ancestral sequence reconstruction Genetic exchanges shape the evolutionary diversification among Shigella phages

The Toll-like receptor (TLR) are best known for their roles in innate immunity via recognition of pathogen and initiation of signaling response. Mammalian TLRs recognize molecular patterns associated with pathogens and initiate innate immune response. We have studied the evolutionary diversity of mammalian TLR genes for differences in immunological response. Reconstruction of ancestral sequences is a key aspect of the molecular evolution of TLR to track changes across the TLR genes. The comprehensive analysis of mammalian TLRs revealed a distinct pattern of evolution of TLR9. Ancestral sequence reconstruction analysis also revealed that the gradual evolution of TLR genes in several ancestral lineages leads to the distinct pattern of TLR9. It demonstrates evolutionary divergence with the progressive accumulation of mutations results in the distinct pattern of TLR9.

Genetic exchanges shape the evolutionary diversification among Shigella phages

The horizontal transfer of genetic information in bacteriophages result in the formation of mosaic genomes. Shigellosis is emerging as a concerned health issue in the present era of antibiotic resistance. Bacteriophages are also known to drive the genetic exchanges among their host bacteria enabling them to gain more fitness. The primary aim of our study was to identify the genetic exchanges occurring in the Shigella phages and associate them with the infecting host species, phage lifestyles to study the constraints acting upon it. The genomic traits were studied with reference to exchanged genes and the ancestral genes with their impact on the dynamics of protein evolution along with detailed curation of the functions being gained due to lateral transfer. Host range expansion is observed in the present study among the Shigella phages. However, Shigella phages do not have the propensity for genetic transfer with dissimilar lifestyles. The increase in gene pool of bacteriophages due to horizontal transfer can result in increase of the host range making them more suitable for their applications in phage therapy against antibiotic resistant bacteria.

Conferences / Seminars /Workshops / Meetings / Trainings Attended

- Participated on four-day workshop on "Capacity Building in Systematic Review" jointly organised by ICMR-NIRBI and WHO during 11/07/2023 to 14/07/2023.
- Delivered lecture on "Bioinformatics: New Era of Biology" in the Bioinfesto (webinar) organised by Department of Bioinformatics, Maulana Abul Kalam Azad University of Technology on 12/08/2023.
- Delivered lecture on "Host-pathogen interaction and molecular evolution of the SARS-CoV-2 spike proteins with respect to host diversity" in the National Seminar on "Recent Advances in Animal Science" organised by Department of Zoology, Visva-Bharati University during 07/03/2024 to 08/03/2024.

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

Conferences / Seminars /Workshops / Meetings / Trainings Attended

- Participated in Expert Workshop on Climate Change Impacts on Health and Health System Response in the Indo-Pacific Region (iv virtual mode) on November 21, 2023 held in New Delhi.
- Participated in 10th Indian Exhibition Cum Fair 2023 at KMDA Ground, Patuli during Dec 6 - 10, 2023.
- Participated in the "Great Exhibition cum-Fair Sundarban Kristi Mela O Loko sanskriti Utsab 2023" during the period 20th -29th December, 2023 at Kultali, South 24 Parganas
- Attended the International Workshop on "Impacts of Climate Change on Small Island Developing States (SIDS)" organised by NAM S&T Centre during 28-29 February 2024 in Virtual-Mode
- Conducted GCP inspection training organised by CDSCO, East Zone, Nizam Palace, Kolkata from 6th to 9th Feb, 2024
- Participateed in Site Level Training of National Integrated Biological and Behavioural Surveillance (IBBS) among Male Clients of Female Sex Workers during 6th - 8th February 2024 at ICMR-NIRBI, Kolkata
- Conducted a session on Basic Study Designs in the Capacity Building Workshop on Clinical Research Essentials organized by MRHRU, Darjeeling of ICMR-NIRBI at Siliguri
- Attended the webinar "An Introduction to Evidence Based Medicine & GRADE Methodology'' by Dr Rajiv Bahl, Secretary DHR & DG ICMR on February 12th, 2024
- Attended the webinar on "Understanding the role of social media in scientific and research communication" organised by ICMR in coordination with Capacity Building Commission (CBC) is March 7, 2024
- Conducted a meeting with DME, Sikkim regarding establishment of MRHRU in the State on March 18, 2024

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

Indian Network of population-based Surveillance Platform for Influenza and other Respiratory Viruses among Elderly (INSPIRE-II)

We aimed to assess the associated risk factors among adults aged >60 years hospitalized with pneumonia. Influenza viruses were detected in 12.3%, RSV in 2.2%, and ORV in 6.3%. Critical care was required for 39.4%, with 9.9% in-hospital mortality. Diabetes, anemia, low oxygen saturation at admission, ICU admission, and mechanical ventilation were associated with mortality.

We also estimated the cost of ARI episodes and its determinants. The mean cost of AURI episode was US$13.9, while that of a pneumonia episode was US$25.6, with indirect costs comprising three-fourths of the total. From the study, we could conclude that high ICU admission and 30-day mortality rates were observed among older adults with pneumonia, and significantly linked to influenza and RSV infections. Given the high community disease and cost burden of ARI, intensifying public health interventions to prevent and mitigate ARI among this fast-growing older adult population in India is warranted.

A Phase II/III, Multicenter, Double-Blind, Randomized, Active Controlled Study to evaluate Safety and Immunogenicity of SII Inactivated Salk Polio Vaccine (Adsorbed) in comparison with SII Licensed Inactivated Poliovirus Vaccine (IPV)

In the background of global shortage of IPV and to replace the use of OPV in future as an important component of GPEI's Polio Eradication and Endgame Strategic Plan, we have joined one multi centric trial to assess the safety and immunogenicity of a reduced antigen adjuvanted dose preparation of IPV, inactivated Salk Polio Vaccine (Adsorbed), with licensed IPV. NIRBI has enrolled 130 children at birth. The study is ongoing. This is particularly important for our country, where cost is an issue.

Immunogenicity and safety of JENVAC and JEEV vaccines administered in an interchangeable dosing schedule among Healthy Indian children: A Multicentric, Phase IV, Open-Labeled, Randomized, Controlled Trial

In India, since no evidence existed for the interchangeable use of available JE vaccine i.e JEEV and JENVAC, this ongoing study, funded by ICMR, is aimed to bridge this evidence gap and used different mixed JE vaccine dosage regime as an intervention and compared the safety and immunogenicity against single vaccine dosage regimen. In India, total of 900 children are planned to be enrolled in four arms of the study and the participants are to be dosed with two doses of JE vaccines at the age of 9-12 month and at 16-24 month consecutively..ICMR-NIRBI has enrolled 54 participants till date and safety follow up is ongoing.

Conferences/ Seminars/ Trainings attended/ organized

- Oral Presentation at the workshop and discussion on the extended analyses of datasets from past studies of cholera, rotavirus, and typhoid fever organized by the International Vaccine Institute (IVI), Seoul., Korea
- Poster presentation titled 'Do oral cholera vaccine (OCV) and water, sanitation, and hygiene (WASH) combine to provide greater protection against cholera? Results from a cluster-randomized trial of OCV in Kolkata, India.' at the 57th United States - Japan Cooperative Medical Science Program (USJCMSP) - Joint Panel Conference on Cholera and Other Bacterial Enteric Infections from December 12-14, 2023

Awards/ Honors received

- Fellowship, National Academy of Sciences, India (FNASc)
- Fellowship Indian Public Health Association (FIPHA)
- Fellowship, West Bengal Academy of Science and Technology (FAScT)
- Membership, National Academy of Medical Sciences, New Delhi (MNAMS)
- Awarded best paper titled "Kanungo S, Chatterjee P, Bavdekar A, Murhekar M, Babji S, Garg R, et al. Safety and immunogenicity of the Rotavac and Rotasiil rotavirus vaccines administered in an interchangeable dosing schedule among healthy Indian infants: a multicentre, open-label, randomised, controlled, phase 4, non-inferiority trial. The Lancet Infectious Diseases. 2022 Aug 1;22(8):1191-9.

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

Development of a Framework to identify Research priorities for mitigating the impact of Climate Change on HIV Response in India

The overlap between climate change and HIV/AIDS is of paramount global public health importance, particularly since both disproportionately impact regions of global vulnerability. Overall, the pathways linking the two are more indirect, as there is no plausible explanation nor evidence of climate change's direct influence on the virus itself. The primary objective of the proposed study is to develop a broad framework to identify research priorities for mitigating the impact of climate change on HIV response in India through synthesizing the evidences on issues associated with HIV/AIDS and Climate Change followed by evidence generated three Technical Resource Group Consultation. The work has just been completed and report preparation is in the process

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

This ICMR funded cross-sectional diagnostic validation study was conducted involving 300 suspected UTI cases recruited from one SDH (Baruipur SDH) and one BPHC (Sonarpur BPHC) of South 24 Parganas district through consecutive sampling. The Rapidogram kit showed a very high specificity (99.6%; 97.9% -99.9%) and considerably high sensitivity (90.6%; 74.9% – 98.0%). We observed higher PPV, NPV and test Accuracy (> 96%). A high Kappa value (0.928) indicated very high agreement between both the methods. Hence use of Rapidogram as a POC in peripheral health setting will be useful to reduce inappropriate antibiotic prescription and risk of developing Antimicrobial Resistance. Based on our recommendation the manufacturer has improved the kit and the kit has been taken up by National Health System Resource Centre for implementation in NHM. The manuscript is also published in Scientific Reports Journal.

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

This ICMR funded study was planned to assess the scope of implementing AMSP in three tier health facilities. It is a multi-tier based convergent parallel study which envisages to develop a level specific customized framework for implementation of AMSP at all levels. Currently this project is ongoing in nine Government run institutions (3 from each tier) across three districts of West Bengal, namely South 24 Parganas; Bankura; Malda. So far, from S 24 PGS district we have collected 606 specimens. Out of which 397 were of UTI cases, 41 were from septicemia patients, 145 rectal swabs from diarrhea patients and 23 throat swabs from URTI cases. Isolation rate in urine sample was 13.6% , isolation rate in rectal swab was 18.2%.The most common pathogen isolated in urine specimen causing UTI was E.coli with higher sensitivity to Nitrofurantoin and Co-trimoxazole. S.flexneri 2a was the commonest organism identified from the stool samples showing sensitivity to third generation cephalosporins , azithromycin and aztreonam. From Bankura district, total sample collected was 279, out of which 140 urine, 117 blood and 12 rectal swab and 10 throat swab was collected. Isolation rate was much comparison to S24 PGs in urine. 15% of blood samples were positive showing the growth of MRSA and Staph aureus. In Malda district out of 83 samples, 30 urine, 14 blood, 36 rectal swab and 3 throat swab. The preliminary findings of this project has been taken up by district health authority of S 24 PGS for developing their district specific antibiotic guideline. Qualitative data collection are ongoing in this project. Some of the key findings of qualitative data are : 1) Lack of awareness on AMR both among clinicians and nurses emerged to be another major theme. 2) Introduction of a position of infection control nurse at all tiers of hospitals, distribution of guidelines on empiric treatment for common infections, introduction of prescription audit using hospitals' own staff, increased monitoring by district health authorities identified to be the facilitators for implementing antimicrobial stewardship program at primary and secondary level.

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

- Attended the WHO Workshop on Systematic Review in the month July 2023 in Vedic Village, West Bengal. Approximately 30 participants took part.

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

Initiatives towards Health Systems research on AMR & Tuberculosis

Two major projects were undertaken during Aprill 2023 to till date namely Anti-Microbial ResistanceResearch & Evidence Synthesis for Stewardship implementation and Surveillance program development framework assessment (AMRES) and Acceleration of TB elimination in selected districts of India (Acc TBEL). Through the AMRES project, the need of implementation of tailored antimicrobial stewardship in lower tier hospitals was identified. The Acc TBEL project identified additional approximately 180 TB patients through arranging handheld Xray camps in two blocks of Murshidabad in three months. As, Government of India is aiming for TB elimination now, this additional contribution to the program is very important.

M. Bhaumik (Principal Investigator), Immunology Division

Anti sense morpholino targeting sphingosine kinase 1 prevents colitis

Morpholino, clinically used for muscular dystrophy brings strength to its potential as therapeutic technology in diseases having limited chemo-therapeutic options. The team endeavoured to exercise such enterprise in IBD, a model disease of defective immune homeostasis. Armed with past experience on morpholino synthesis and thereafter its successful application in knocking down (KD) gene of interest in mice, this project was designed to create sphingosine kinase-1 (SK1) KD mice. A therapeutic target for IBD is SK1, overexpressed in colonic tissue and affects immunological homeostasis. The GMO-PMO chimeric oligonucleotides targeting SK1 with cell penetrating property is synthesized using the standard protocol. Since DSS induced colitis is the model of IBD in mice, after intravenous injection of GMO-PMO organ distribution, toxicity, and selectivity to KD SK1 in mice is carried out. So far GMO-PMO did not show any toxicity in mice and further research are on the way to understand the efficacy of the treatment for colitis in mice.
Implication: GMO-PMO targeting SK1 is likely to fulfil the hope for treatment of IBD.

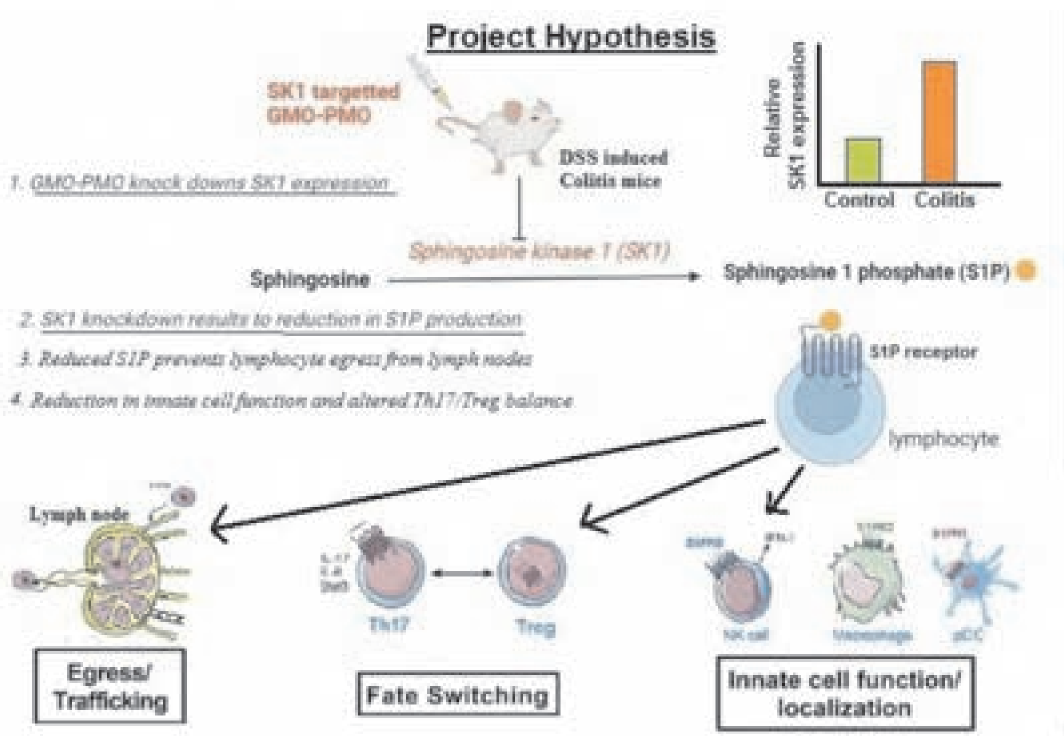


Fig 21: The project hypothesis showing how SK1 GMO-PMO targets the SK1 gene and prevents colitis by altering various immune functions

Awards/ Honors received

- Indo-French PROWIS Fellowship CEFIPRA

Post and Pre-Doctoral Fellows:

Post-Doctoral Fellow:

Dr. Sohini Sikdar, Project scientist, ICMR intramural

Dr. Oishika Das, Project scientist, ICMR intramural

Pre-Doctoral Fellow:

Ms. Aaheli Masid, SRF-CSIR

Ms. Ankita Dutta, SRF-ICMR project

Mr. Diganta Roy, JRF-UGC

S. Ganguly (Principal Investigator), Parasitology Division

Differential pathogenesis of *Giardia*: Genomic variations of local isolates: Funded by National Institute of Infectious Diseases, Japan

To investigate the Genetic variability of *Giardia duodenalis* regarding its oxidative stress management genes like flavoproteins, SOR, NADH oxidase, and flavo-hemoprotein (gFlHb), the full-length coding sequence (CDS) of gFlHb, NR-2, NR-1, and PFOR genes were sequenced from *Giardia*-positive stool samples, scrutinized for single nucleotide variants (SNVs) compared to the reference sequence and identical sequences were grouped into haplotypes, and their diversity was further analysed.

In Kolkata, subtype B3 was identified as the most prevalent (34.13%), with A2 and A1 being less common human-infecting subtypes. The study uncovered nine distinct sequences or haplotypes, representing different alleles of the genes. The population displayed 10 different B genotypes and 3 different A genotypes. B genotypes exhibited higher haplotype diversity (0.797±0.044) compared to A genotypes (haplotype diversity-0.458±0.096). The number of non-synonymous (ns) SNVs was notably higher in B subtypes (1.06%) than in A (0.4%).

A positive Tajima's D value (D= 1.985) for the B genotypes suggests under balancing selection, indicating their potential to adapt to diverse environments, particularly oxidative stress within the host gut. Such heterogeneity might contribute to the parasites' adaptability under oxidative stress, possibly impacting drug resistance development. Several identified nsSNVs may induce conformational changes in candidate protein products responsible for drug metabolism and oxidative stress management.

State wise prevalence mapping of soil transmitted helminthes in Indian children to support health impact evaluation. A ministry of health and family welfare, Govt. of India initiative and WHO

An initiative was undertaken to assess the helminth burden across different age groups in various states of India. Division of Parasitology of ICMR-NIRBI actively participated in this effort as one of the network members and conducted investigations on soil-transmitted helminths (STH) among children from lower socio-economic backgrounds. This division conducted follow-up studies, and these studies confirmed the prevalence of soil-transmitted helminths in Chattisgarh (12.7%) and Tripura (1.3%). The follow-up studies further confirmed a significant decrease in STHs after deworming (Fig 22). The project has garnered support from WHO, DIWI, NCDC, different state governments, the Ministry of Health and Family Welfare, Government of India, and ICMR.

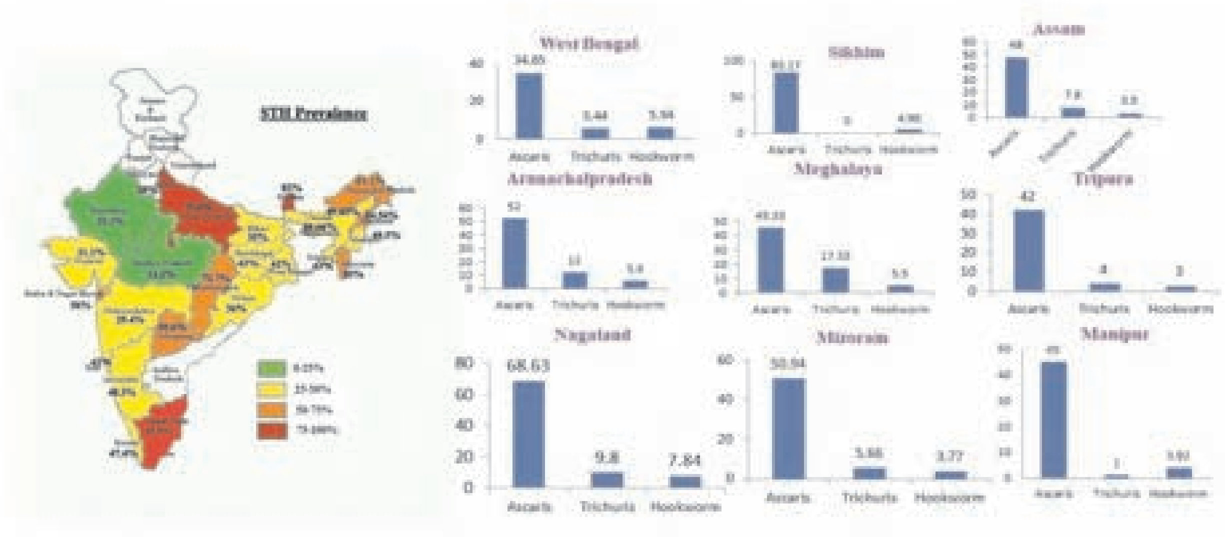


Fig 22: Prevalence of STHs in different states of India

Identification and Molecular Characterization of Common Enteric Parasites in Kolkata with Special Reference to *Entamoeba* spp. Funded by ICMR

Entamoeba moshkovskii, according to recent studies, appears to exert a more significant impact on diarrheal infections than previously believed. The efficient identification and genetic characterization of *E. moshkovskii* isolates from endemic areas worldwide are crucial for understanding the impact of parasite genomes on amoebic infections. In this study, we employed an MLST system to characterize *E. moshkovskii* isolates, with the aim of assessing the role of genetic variation in the pathogenic potential of *E. moshkovskii*. We incorporated three potential genetic markers – KERP1; amoebapore C (apc); and Chitinase. Sequencing was attempted for all target loci in 68 positive *E. moshkovskii* samples, and successfully sequenced a total of 33 samples for all three loci. The analysis revealed 17 distinct genotypes, labelled M1-M17, across the tested samples when combining all loci. Notably, genotype M1 demonstrated a statistically significant association with diarrheal incidence within *E. moshkovskii* infection (p=0.0394). This suggests that M1 may represent a pathogenic strain with the highest potential for causing diarrheal symptoms. Additionally, we have identified a few SNPs in the studied loci that can be utilized as genetic markers for recognizing the most potentially pathogenic *E. moshkovskii* isolates. In our genetic diversity study, the apc locus demonstrated the highest Hd value and π value, indicating its pivotal role in reflecting the evolutionary history and adaptation of the *E. moshkovskii* population. Furthermore, analyses of linkage disequilibrium(LD) and recombination within the *E. moshkovskii* population suggested that the apc locus could play a crucial role in determining the virulence of *E. moshkovskii* (Fig 23).

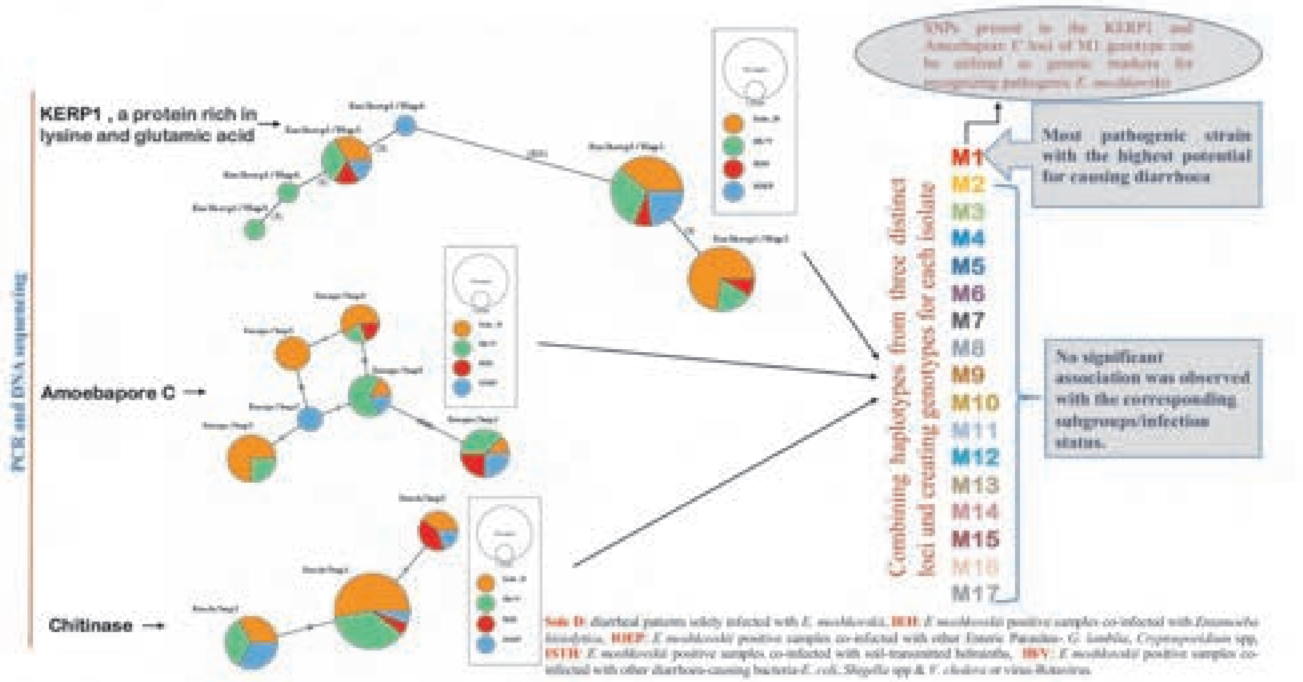


Fig 23: Genetic characterization *E. moshkovskii* population using MLST system

Characterization of the Pathogenic Factors of Local Isolates of *Giardia lamblia*. Funded by ICMR

In areas with limited resources, *Giardia duodenalis*, is a common cause of diarrheal illness with an overall prevalence of 6.8%. A multilocus genotyping on 52 human *Giardia* isolates from diarrhoeal patients revealed Assemblages A (30.8%) and B (63.5%), as well as a combined assemblage of A+B (5.7%), are found to be the human-infecting subtypes and A1, A2, B3, and B4 was identified at the sub-assemblage level via multilocus genotyping of local *Giardia* isolates. Two age groups—>0–5 years and >5–12 years—were substantially linked to this parasitic infection. There were 17.3% of sub-assemblages AII found, followed by sub-assemblage AI (13.5%). Significant genetic diversity was observed within assemblage B population, hinting at ongoing balancing selection. The high prevalence of the parasite, among children and numerous distinct genotypes circulating within this confined geographic area raises considerable concerns and calls for robust control measures, meeting the urgent need for swift and cost-effective detection and genotyping methods for *Giardia* is crucial for extensive epidemiological studies and clinical diagnostics. To address this demand, we devised a multiplex PCR-RFLP technique targeting the *tpi* gene of *G. duodenalis*. The assay effectively screened *G. duodenalis*-positive clinical samples (6.33%; 36/565) and categorized the isolates into assemblages A (41.66%; 13/36) and B (58.33%; 23/36), as well as into sub assemblages: AI (13.8%; 5/36), AII (27.77%; 10/36), BIII (36.11%; 15/36), and BIV (22.22%; 8/36). Demonstrating high diagnostic sensitivity (94.2%), specificity (100%), and accuracy (97.1%), the PCR assay indicates reliability in diagnosing giardiasis. Importantly, the assay exhibits close concordance with microscopy (κ=0.85) and reference PCR (κ=0.98) results (Fig 24).

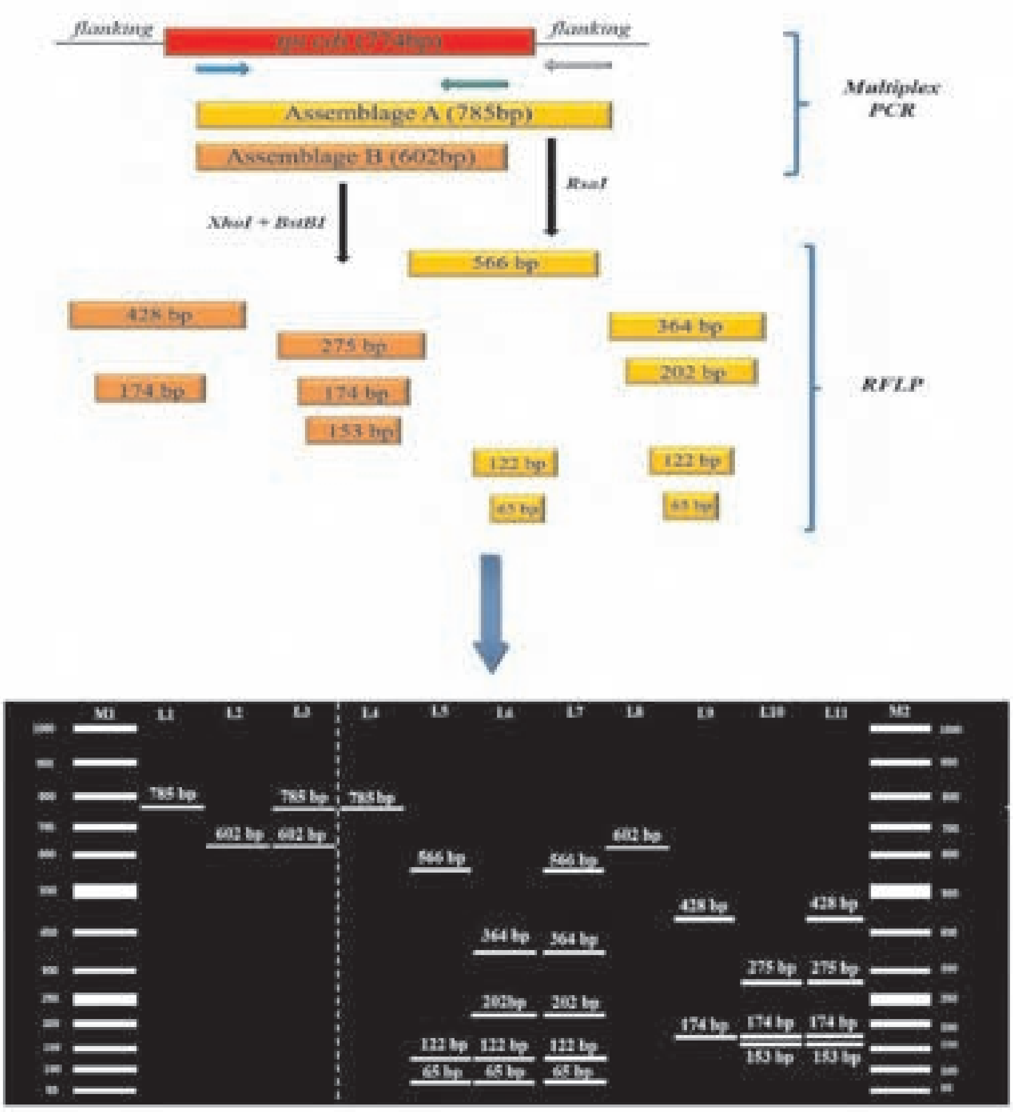


Fig 24: Schematic diagram showing work flow and all band patterns obtained after multiplex PCR and subsequent RFLP method.

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

The present study aimed to determine the effect of andrographolide, an active compound of the *Andrographis paniculata* plant, on the morphology transformation and to investigate the alteration in the gene expression level of *Giardia lamblia*. Investigation of the effects of *A. paniculata* plant crude extract and andrographolide, a compound of *A. paniculata*, on *G. lamblia* revealed a substantial degradation of DNA, alteration in morphology, inhibition in adherence, ROS generation and inhibition of the cell cycle in *Giardia* trophozoites. The findings suggest that *A. paniculata* extract contains potential compounds that could serve as a therapeutic treatment for giardiasis. This approach aims to provide a natural therapeutic solution for giardiasis, aiming to minimize side effects and decrease the risk of drug resistance.Our investigation also focused on the effect of Andrographolide (ADG), an active compound of the *Andrographis paniculata* plant, on *Giardia lamblia*, assessing trophozoite growth, morphological changes, cell cycle arrest, DNA damage and inhibition of gene expression associated with pathogenic factors. ADG demonstrated anti-*Giardia* activity almost equivalent to the reference drug metronidazole, with an IC_{50} value of 4.99 µM after 24 hours of incubation. Our findings have revealed the anti-giardial efficacy of ADG, suggesting its potential as an agent against *Giardia* infections. This could offer a natural and low-risk treatment option for giardiasis, reducing the risk of side effects and drug resistance. Significant results have been obtained from the project, and this year we have processed and analyzed the received data. One research article has been accepted in **Tropical Biomedicine**, and another article is in **the final stage of revision**, with hopes of acceptance in the next few weeks.

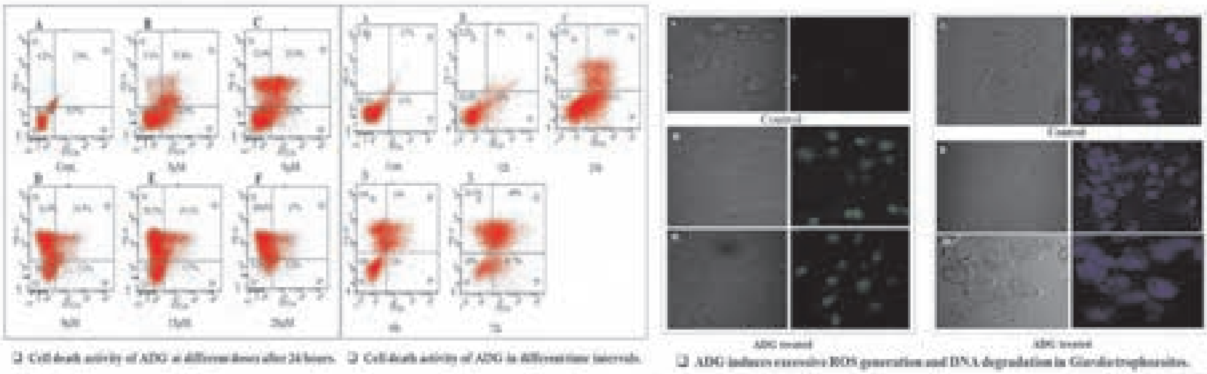


Fig 25: The graph illustrates the dose and time kinetics results of Giardia trophozoites stained with FITC-PI and treated with ADG. Cells were categorized based on their treatment response: quadrant Q1 represents necrotic cells, Q2 represents late apoptotic cells, Q3 represents living cells, and Q4 represents early apoptotic cells.

Human pulmonary paragonimiasis in crab eating communities and smear negative suspected TB cases from some states of India. Funded by ICMR:

To determine the prevalence of Paragonimiasis, the Division of Parasitology, ICMR-NIRBI initiated community-based surveys in various districts of West Bengal, including South 24 Parganas, Alipurduar, Jalpaiguri, and Paschim Medinipur. This year, a total of 540 active serum samples, with 2.81% positive results in South 24 Parganas and 4.09% positive results in Alipurduar have been tested. Additionally, 260 passive serum samples were screened, revealing 2.63% positive results in South 24 Parganas and 3.52% in Alipurduar. Moreover, the Division of Parasitology collected 9360 freshwater crabs to detect the presence of *Paragonimus* metacercaria (Fig 26). The notably high prevalence rate of *Paragonimus* in freshwater crabs (Telo-kankra) implies their role as hosts or reservoirs in transmitting the species to the human community in the studied area.

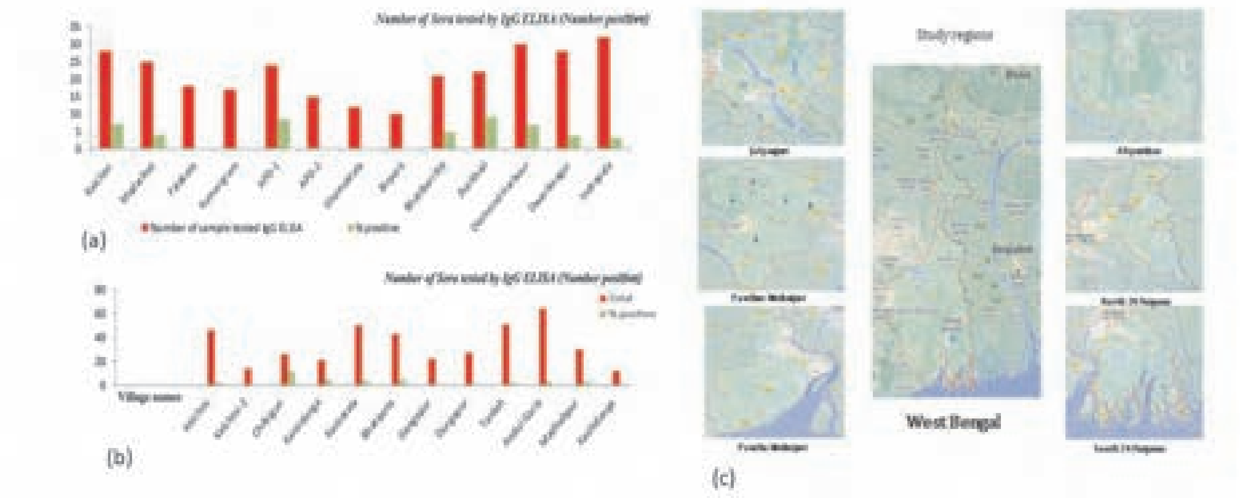


Fig 26: (a) Graphical representation of percentage of Positive Serum sample obtained from PHC/DMC. (b) Seroprevalence of paragonimiasis in the study villages based on Active community survey. (c) Study area maps in West Bengal

Awards/ Honours received

Parasitology lab has got NABL accreditation in 2018 and this is the first NABL accredited lab in India for PCR identification of different enteric parasites. We are maintaining the QC as per NABL auditing since then until the present fiscal year.

Conferences / Seminars /Workshops / Meetings / Trainings Attended:

Conference Title	Date	Place	Organizer	Status
• 2nd International Conference on Combating Antimicrobial Resistance. **CAMR** 2024, Puducherry, India	5th January 2024 to 6th January 2024	Puducherry, India	Department of Microbiology Under the auspices of Academy of Clinical Microbiologists (ACM)	Oral Presentation
• ICMR-NIRBI and NIID, Japan Bilateral meeting -2024	14th January 2024 to 19th January 2024	Japan	NIID, Japan	Oral Presentation
• National Public Health India Conference **NPHICON**-2024	23rd February, 2024 to 25th February, 2024	New Delhi	National Centre for Disease Control (NCDC), Directorate General of Health Services, Ministry of Health and Family Welfare, Govt of India	Poster Presentation
• CISO Deep Dive Training on Cyber Security for ICMR	March 18th 2024 to March 22nd 2024	New Delhi	Indian Institute of Public Administration (IIPA), ITO, New Delhi.	Training

Ph.D. Awarded

Name: Dr. Sanjib Kumar Sardar

Title of the Thesis: Identification and Molecular Characterization of Common Enteric Parasites in Kolkata with Special Reference to Entamoeba spp

University: Jadavpur University

Date of award: 07-12-2023

Post and Pre-doctoral Fellows

Pre-Doctoral Fellow:

Ms. Rituparna Sarkar, SRF-CSIR.

Ms. Ajanta Ghosal, SRF-ICMR.

Mr. Tapas Haldar, SRF-CSIR.

Mr. Akash Prasad, Research Assistant.

Ms. Chayanika Roy, SRF-UGC.

Ms. Sweety Mal, JRF-UGC.

A. Pal (Principal Investigator), Pathophysiology Division

Purification and characterisation of environmental microbial protease Peptidase M84 and its role in apoptosis of cancer cells.

In our earlier studies we had shown the role of hemagglutinin protease from *V. cholerae* in causing tumour regression of EAC (breast cancer cells) in mice model (Apoptosis 2015). We also showed that HAP induces cell death by intrinsic pathway of apoptosis by activating the PAR1 receptor (Apoptosis 2016). From the HAP induced cleavage of PAR1 a novel pro-apoptotic peptide was synthesized and used to kill cancer cells both *in vivo* and *in-vitro* (Apoptosis 2018). Previously, we have also reported bacterial subtilisin, a serine protease capable of potentiating apoptosis via ubiquitin-mediated tubulin degradation pathway in breast cancer cells (Singh N. et, al., IJBM, 2022).

In pursuit of isolating novel anticancer proteases from **environmental microbial isolates**, we have purified and identified an **extracellular metallo-protease** from ***Bacillus altitudinis*** named **Peptidase M84**. This protease selectively triggered **apoptosis** in human ovarian adenocarcinoma cells (PA-1, SKOV3) and mouse ovarian carcinoma cells (ID8), in addition to exhibiting no significant effect on normal human epithelial ovarian cell (IOSE) and mouse peritoneal macrophage (PEMΦ) cell viabilities. **Protease-activated receptor-1 (PAR-1)**; a GPCR which is reported to be overexpressed in ovarian cancer cells was identified as a novel target of Peptidase M84. We observed that Peptidase M84 induced PAR-1 overexpression along with activating its downstream signalling effectors NFκB and MAPK to promote excessive reactive oxygen species (ROS) generation in ovarian cancer cells. This disrupted mitochondrial membrane potential, allowed the cytosolic release of mitochondrial cytochrome c, increased the Bax (pro-apoptotic) to Bcl-2 (anti-apoptotic) ratio and promoted DNA damage to evoke apoptotic death of the ovarian cancer cells. Peptidase M84 also reduced nuclear ki-67 expression in these malignant cells to render an anti-proliferative role. In an *in vivo* set-up, weekly intraperitoneal administration of Peptidase M84 (12 μg/kg body-weight) in the syngeneic mice model significantly diminished ascitic fluid accumulation through induction of oxidative stress, increasing murine survival rates by 60%. Collectively, our *in vitro* and *in vivo* findings suggested that Peptidase M84 triggered PAR-1 mediated **oxidative stress** to act as an apoptosis inducer in ovarian cancer cells. This established Peptidase M84 as a promising drug candidate for **receptor-mediated mediated targeted therapy of ovarian cancer**.

The objective of our study, therefore involved screening of environmental microbial isolates to identify a naturally occurring microbial protease with apoptosis capacitating potentials and deciphering its anticancer mechanism. In this study, we report that Peptidase M84, an extracellular metallo-protease purified from an environmental isolate of gram-positive *Bacillus altitudinis* can augment oxidative stress by altering PAR-1 activity to trigger apoptotic signalling in human and mice ovarian carcinoma cells with **high selective toxicity**. Our present study provides a deeper insight into the mechanism underlying **Peptidase M84-induced apoptosis in ovarian cancer cells** in a PAR-1/ROS-dependent manner which was not elucidated previously. Thus, Peptidase M84 may be employed for its chemotherapeutic efficacy in the future for **ovarian cancer amelioration**. This work recently has been published as a research article in **iScience** (**https://doi.org/10.1016/j.isci.2024.109828**).

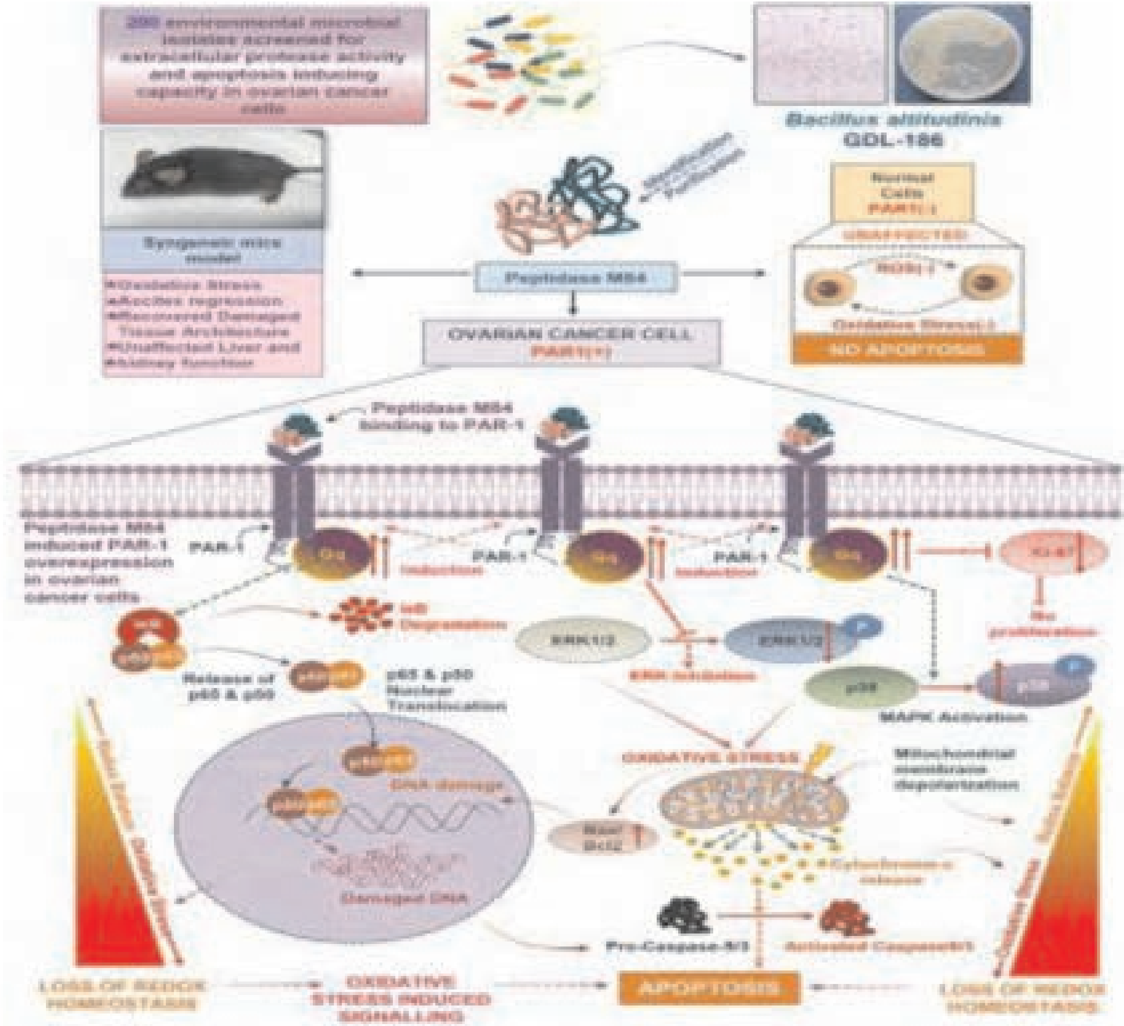


Fig 27: Peptidase M84 was purified from *Bacillus altitudinis* to isolate anticancer proteases from environmental microbial isolates. This metallo-protease had no discernible impact on normal cell survival, but it specifically induced apoptosis in ovarian cancer cells. PAR-1, a GPCR that is reported to be overexpressed in ovarian cancer cells, was identified as a target of Peptidase M84. We observed that Peptidase M84 induced PAR-1 overexpression along with activating its downstream signaling effectors NF-κB and MAPK to promote excessive reactive oxygen species (ROS) generation. This evoked apoptotic death of the ovarian cancer cells through the intrinsic route. In an *in vivo* set-up, weekly intraperitoneal administration of Peptidase M84 (12.0 µg / kg of body weight) in syngeneic mice significantly diminished ascites accumulation, increasing murine survival rates by 60%. Peptidase M84 induced activation and overexpression of PAR-1 thus enhancing cellular ROS and activation of NF-κB, p38 followed by downregulation of pERK1/ 2. ROS mediated DNA damage induced changes in mitochondrial membrane potential and triggered the release of mitochondrial cytochrome c which subsequently activated caspase 3 ultimately promoting Bax, Bcl2 mediated intrinsic pathway of apoptosis. Enhanced ROS level in malignant cells allows them to meet the threshold level of cellular ROS that affects cell survival earlier than the normal healthy cells ultimately triggering apoptotic cell death. Collectively, our findings suggested that Peptidase M84 triggered PAR-1-mediated oxidative stress to act as an apoptosis inducer. This established Peptidase M84 as a drug candidate for receptor-mediated targeted therapy of ovarian cancer.

Awards/Honours received

"Best Oral Presentation Award" in national seminar on "Trends in Biomedical Research: Advances and challenges" Organized by Central Ayurveda Research Institute, Kolkata, India, 2024.

Title: *Vibrio cholerae* hemmagglutinin protease: A novel microtubule targeting agent to kill colon cancer cells by triggering multiple cellular proteases and proteasomal cascades and induced apoptosis in explant culture of human clinical samples
Tanusree Ray, Pinaki Roy, Amit Pal

Patent(s) filed/accepted /Technology developed

Indian patent
Patent No: 458643
Date of patent filling: 31.01.2018
Date of issue: 12.10.2023
Name of the claim: A novel pro-apoptotic peptide for selective elimination of malignant cells.
Name of the inventor: Dr. Amit Pal, Dr. Tanusree Ray and ICMR

Post and Pre-Doctoral Fellows

Post-Doctoral Fellow:
Dr. Rima Tapader, PDF-ICMR
Dr. Tanusree Ray, DBT Women's Scientist)

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

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

Group-A Rotavirus and other enteric viruses among children with acute gastroenteritis

The surveillance and molecular characterization of enteric viruses aim to assess the prevalence of enteric viruses following the introduction of the RV vaccine in West Bengal. The introduction of the RV vaccine has led to significant changes in the proportion of enteric viruses in several countries. From April 2023-March 2024, 509 samples were screened of which 33% (n=168/509) samples tested positive for one or more enteric viruses. Positivity rate of Group-A rotavirus, Human Adenovirus species F, Astrovirus and Caliciviruses (Norovirus GI/GII and Sapovirus) was 17.5% (n= 89/509), 7.9% (n=40/509), 3.5% (n=18/509) and 4.1% (n=21/509) respectively (Fig 28). Compared to the pre-vaccine positivity rate observed during 2016-2018 (~33%), there was significant reduction in rotavirus infection during the 2023-24. Frequency of rotavirus induced gastroenteritis was higher among children belonging to 12-24 months while the highest calicivirus and adenovirus infections were observed among children aged between 6-12 months. Among the rotavirus-positive samples, the G3 genotype was found to be the predominantly circulating genotype, accounting for 45.5% of cases, followed by G2 (29.5%), G1 (13.6%), with 11.4% of samples being untypeable.

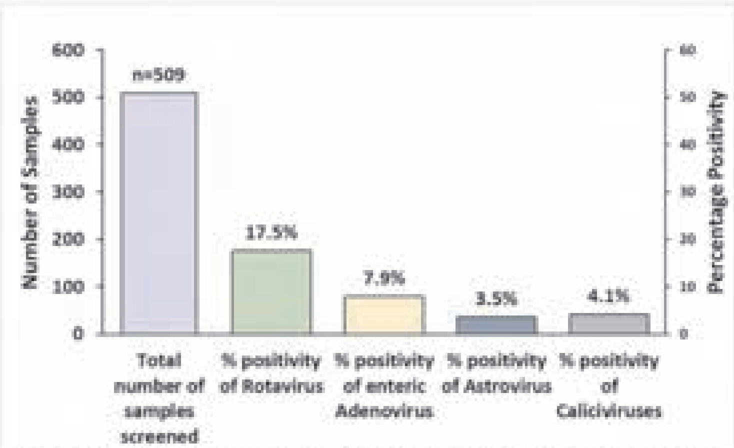


Fig 28: Enteric virus positivity among children with acute gastroenteritis in Kolkata, India during April'2023-March'2024

First report for full genome sequences of circulating Norovirus strains from eastern India

A comprehensive full genome analysis of Norovirus strains (2017-2021), revealed circulation of the newly emerged GII[P16] polymerase type in association with different capsid genotypes like GII.4, GII.3, GII.16 and GII.13, suggesting its ability to recombine with multiple capsid genotypes. Comprehensive mutation analysis and selection pressure analysis of this GII[P16] viruses identified both positive and negative selection sites. Further analysis of GII[P16] strains has educed substitution in multiple amino acid residues within the non-structural proteins among the circulating GII.4 and GII.3 strains. Inter-genotype recombinant norovirus strains like GII.4 Sydney [P16], GII.4 Sydney [P31], GII.3[P16] and GII.13[P16] were also detected during this study. During this study, a GII.17 norovirus (NIRBI-BCH-11889) with an untypeable polymerase type was detected, which was closely related to GII[P38] type but different from currently known P-types. This study highlights the circulation of diverse norovirus strains in eastern India. These findings are important for understanding norovirus epidemiology in India and may have implications for future vaccine development (Fig 29).

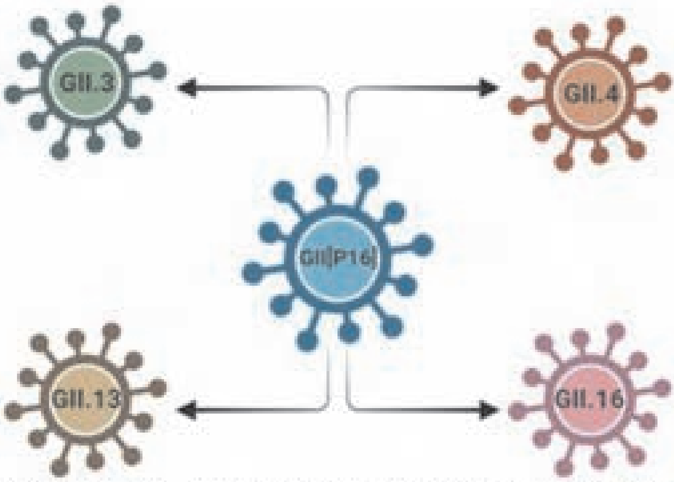


Fig 29: Diagrammatic representation showing potential of the newly emerged GII[P16] polymerase type to recombine with various capsid genotypes of NoV.

Strategy to identify virus specific regulatory long non-coding RNAs during Rotavirus infection: In pursuit to identify biomarkers for acute viral infections

Long non-coding RNAs (lncRNAs), which are a subset of non-coding RNAs of more than 200 nucleotides in length, are reported to play a regulatory function in numerous viral infections. An RNA sequencing array in RV infected HT-29 cells identified large number of differentially induced long non-coding RNAs (lnCRNAs) which positively regulated viral replication. A highly upregulated (>100 fold) lncRNA SLC7A11-AS1 was identified through this extensive profiling of lncRNAs. Knockdown of SLC7A11-AS1 noticeably reduced RV titers implying its pro-viral significance. RV-induced SLC7A11-AS1 downregulates the gene SLC7A11/xCT that encodes the light chain component of the system XC- cystine-glutamate exchange transporter, leading to decrease in intracellular GSH level and increase in lipid peroxidation, which are salient features of ferroptosis. Cumulatively, the study delineate that RV infection triggers ferroptotic cell death via SLC7A11-AS1/xCT axis to facilitate its own propagation (Fig 30). SLC7A11-AS1 also has potential to be exploited as a biomarker for identifying viral infection.

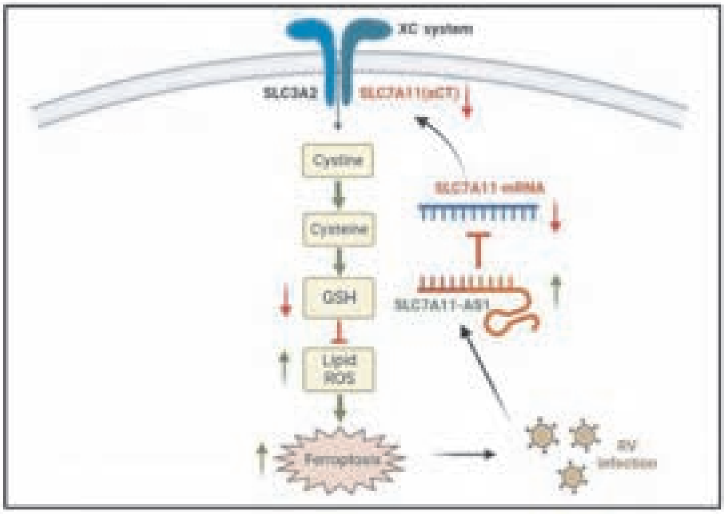


Fig 30: Graphical representation delineating extensive host lncRNA expression profiling in Rotavirus infection revealed xCT mediated ferroptosis induction by upregulation of SLC7A11-AS1

Rotavirus evades the innate immune responses by downregulating protein ISGylation through proteasomal degradation of Ube1L

In response to viral infections, the cellular process of ISGylation, involving the attachment of an Ubiquitin-like modifier ISG15 to target proteins, plays a key role in regulating innate immunity. Our study investigated this process in relation to Rotavirus (RV) infection. We found that while RV infection increases free ISG15 expression, it inhibits protein ISGylation. This inhibition correlates with a decrease in the Ube1L protein, a key enzyme in the ISGylation process, during RV infection. Further investigation revealed that a viral protein, NSP5, induces the degradation of Ube1L via proteolytic ubiquitylation, involving the host cellular machinery. Additionally, we observed a direct interaction between Ube1L and NSP5 during infection. Interestingly, overexpression of Ube1L reduces RV protein expression and infectivity, which is reversed when ISG15 is silenced, indicating that Ube1L acts as an important anti-viral factor by promoting ISG15 conjugation and inhibiting RV infection (Fig 31).

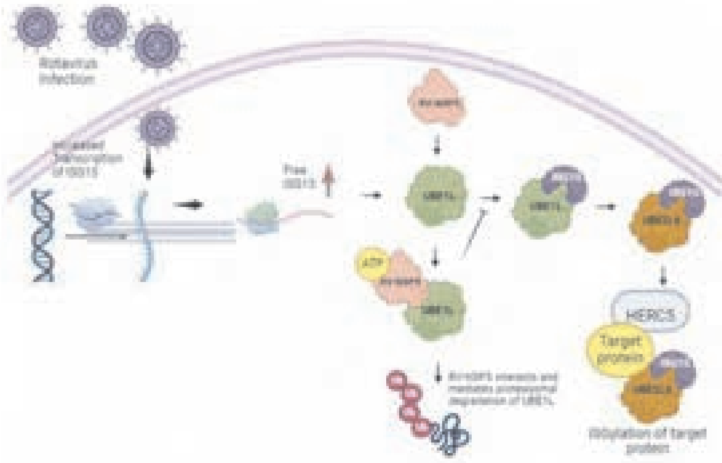


Fig 31: RV-NSP5interacts and mediates proteasomal degradation of Ube1L to counteract the antiviral effects of protein ISGylation

Conferences / Seminars /Workshops / Meetings / Trainings Attended

- CME on Current Scenario of Respiratory Infections on 6th Apr 2023 at the RG Kar Medical College Kolkata. Invited speaker ; Title "Molecular Diagnostics of Respiratory Viruses and its Role in Research". No. of attendees 50.
- State level Seminar on "Selection or Elimination-Which one does a Virus Offer? Organized by Ramakrishna Mission Vidyamandira, Belur, Howrah on 12th April 2023. Delivered a talk titled "Host-directed anti-virals: New strategies for designing antivirals against host factors which positively aid viral infection"
- "Exploration of the Microbial World: Celebration of International Microorganism Day" held by Adamas University, Kolkata on 19th Sept 2023.Invited speaker. Presentation titled "Coupling Host-Rotavirus Interactions for designing antiviral therapeutics: In search of the Achilles's heel". No. of attendees 75
- 7th Molecular Virology Meeting 22-23 Sept 2023 at Indian Institute of Science Bangalore. Invited speaker, Presentation titled "A friend or a foe: Emerging role of long noncoding RNAs in regulating viral infections". No. attendees 100.
- Bilateral NIID-NIRBI meeting on 12th Jan 2024. Delivered a online talk titled Molecular epidemiology of enteropathogenic viruses with special focus on emerging sapovirus in West Bengal, India (2017-2023). No. of attendees 12

Ph.D. Awarded

Name : Dr. Mahadeb Lo

Title of the thesis : Assessing Prevalance and Genetic Diversity of Rotavirus and Norovirus in children with acute gastroenteritis in pre and post vaccination era: A hospital based study in Kolkata

University: University of Calcutta

Date of Award: December 2023

Post and Pre-doctoral Fellows

Post-Doctoral Fellow :

Dr. Arpita Mukherjee, DHR Women Scientist

Dr. Ratul Dutta Chaudhuri , DHR Fellow

Pre-Doctoral Fellows :

Ms. Shreya Banerjee, SRF-UGC

Ms. Priyanka Saha DST Inspire

Mr. Pritam Chandra, SRF-ICMR

Ms. Ritubrita Saha, SRF-UGC

Ms. Ranjana Sharma, SRF-CSIR

Ms. Suvrotoa Mitra, DHR- Women Scientist

A. Chakrabarti (Principal Investigator), Virology Division

Influenza virus interaction with host with special emphasis on cholesterol biosynthesis pathway: Insights into Viral Pathogenesis and Host Defense Mechanisms.

Under the scope of this project, differential regulation of the 3-hydroxy-3-methylglutaryl coenzyme A reductase (HMGCR), has been studied. Our study is the first to show the role of HMGCR and AMFR in influenza virus infection and revealed that AMFR plays a crucial role in the downregulation of HMGCR and the activation of innate immunity following influenza virus infection.

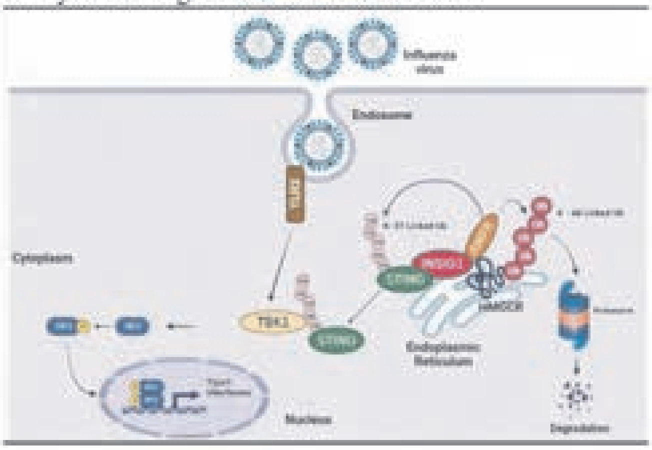


Fig 32: AMFR promotes innate immunity activation and proteasomal degradation of HMGCR in response to influenza virus infection in A549 cells.

Isolation and characterization Diarrhea associated bacteriophages and their use in Phage Therapy".

Antimicrobial resistance (AMR) is a major problem and an immediate alternative to antibiotics is the need of the hour. Research on the possible alternative products to tackle bacterial infections is ongoing worldwide. One of the most promising alternatives to antibiotics is the use of bacteriophages (phage) or phage-driven antibacterial drugs to cure bacterial infections caused by AMR bacteria. We are working to generate a phage bank which may be useful in therapeutic application to combat AMR cholera infection.

Prediction of Phage-driven proteins (PVPs) from phage protein sequences

Phage-driven proteins, including holins, endolysins, and exopolysaccharides, have shown great potential in the development of antibacterial drugs. Likewise, phage virion proteins (PVPs) might also play an important role in the development of antibacterial drugs. We have employed well-known basic and ensemble machine learning methods with protein sequence composition features for the prediction of PVPs and developed a user-friendly web server which is freely available to all users for the prediction of PVPs from phage protein sequences which might facilitate the large-scale prediction of PVPs and hypothesis-driven experimental study design.

Phage typing of *V.cholrae* O1:

As a referal center, the Vibrio Phage Reference Laboratory of ICMR-NIRBI is engaged in phage typing study of *V.cholerae* O1 biotype ElTor strains and *V.cholerae* O139 strains over last few decades to provide services to the nation. Academic and research centres, like medical colleges, hospitals and research institutes around the country keep sending samples/strains for phage typing study.

We have received a total of 103 strains of *V.cholerae* O1 for characterization and phage typing. Serological identification was carried out with each of the strain by using polyvalent O1 and followed by monospecific Inaba and Ogawa antisera. All the strains were characterized by phage typing using the conventional phage typing scheme of Basu and Mukherjee as well as with the new phage typing scheme for V.cholerae O1 biotype ElTor strains. Conventional phage typing scheme of Basu and Mukherjee discriminated the strains into two different types. Using the new phage typing scheme the strains were However, analysis of the phage typing results using the new phage typing scheme revealed the presence of seven phage types among *V. cholerae* O1 biotype ElTor strains. The phage type 27(59.48%) was found as the predominant type followed by type 26 (14.39%) and type 19(6.06%).

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

- Attended Webinar lecture on topic "Scientific Leadership", presented by Dr. R Balasubramaniam,. Conducted By ICMR, New Delhi on 31-08- 2023
- Attended a conference "Protecting India's Senior citizens: Role of Influenza Vaccination." Indian Network of population-based Surveillance Platforms for Influenza and other Respiratory viruses among Elderly (INSPIRE) Conducted By All India Institute of Medical Sciences, New Delhi on 13-09-2023
- Attended the Thursday Learning Hour Webinar on the topic "Intellectual Property for Scientists", presented by Prof. (Dr.) UnnatPandit Conducted By ICMR, New Delhi on 14-09-2023
- Attended the Thursday Learning Hour Webinar on "Government e-Market Place GeM" by Ms Geeta Bansal Conducted By ICMR, New Delhi on 05-10-23
- Attended Webinar on " Science Communication for Scientists" by Dr Kollegala Sharma Conducted By ICMR, New Delhi on 19-10-2023
- Attended Webinar on "Phage therapy compassionate use cases: Mayo Clinic Experience" by Dr. Gina Suh, Conducted By International Bacteriophage Research Consortium (IBRC) & Open Source Pharma Foundation (OSPF) in association with the Indian Society for Bacteriophage Research and Therapy (SBRT) on 23-11-2023
- Attended Webinar on "Bacteriophage therapeutics: Advancing From Anecdotes to Widespread Clinical Application" by Dr. Robert Chip Schooley Conducted By IBRC and OSPF in association with the Indian Society for Bacteriophage Research and Therapy (SBRT) on 05-12-2023
- Attended Webinar on "Phage Australia" by Prof Jonathan Iredell Conducted By IBRC and OSPF in association with the Indian Society for Bacteriophage Research and Therapy (SBRT) on 11-12-2023
- Attended Webinar on " Best practices for patient recruitment and retention in Clinical Trials ", by Dr S Poongothai, Conducted By ICMR, New Delhi on 15-12-2023
- Attended Webinar on "Compassionate Phage therapy experience from India" by Dr. GopalNath Conducted By IBRC and OSPF in association with the Indian Society for Bacteriophage Research and Therapy (SBRT) on 19-12-2023
- Attended Webinar on "Georgia's Experience and Prespectives on Phage Therapy" by Dr. MziaKutateladze Conducted By IBRC and OSPF in association with the Indian Society for Bacteriophage Research and Therapy (SBRT) on 22-12-2023
- Webinar on the theme "Controlling Viral Gastroenteritis: From Gut Microbiome to Vaccines" by. Dr. Vanessa Harris Conducted By ICMR-NIRBI on 30-01-24
- Attended the second webinar on Avian Influenza Conducted By ICMR- New Delhi on 22-02-2024
- Attended Webinar on "*Exploring the Spectrum: Neonatal Sepsis in Focus*" on by Prof. Dr. Arun Kr. Singh Conducted By ICMR- NIRBI, Kolkata on 29-02-2024
- Webinar on the Understanding the role of social media in scientific and research communication" Speaker: Mr.TamseelHussain Conducted By on 07-03-2024
- Delivered a lecture entitled "Influenza chronicles: Exploring the potential impact of avian influenza as global threat" at Presidency University, Kolkata Conducted By on 28-03-2024

Post and Pre-doctoral Fellows

Pre-Doctoral Fellow

Mr. Devendranath Tewari, SRF-UGC

Ms. Sampurna Biswas, SRF-ICMR

Mr. Sanjoy Biswas, SRF-UGC

Ms. Deborima Chatterjee, SRF-UGC

Ms. Anneswa Bhattacharya, JRF-UGC

A. Majumdar (Principal Investigator), Virology Division

Molecular characterization of HIV to detect drug resistance mutations in the population of Eastern part of India

The study aims to identify the different HIV drug resistance mutations among ART naïve and virologic failure PLHIV on first-line and second-line ART along with the prevalent HIV subtypes in the paediatric and adult population of eastern India. A total of 106 cases, were recruited in the study in total till date from the three ART centres of the study. As per protocol, 62 samples with a viral load of more than 1000 copies/ml have been selected for sequencing. Sequencing was done for the detection of consensus drug resistance mutations against any of the four classes of anti-retroviral drugs - nucleoside reverse transcriptase inhibitors (NRTI), non-nucleoside reverse transcriptase inhibitors (NNRTI), and protease inhibitors (PI) in the protease and reverse transcriptase (PR/RT) region and against the Integrase Strand Transfer Inhibitor (INSTI) in the integrase (IN) regions of the HIV-1 pol gene. Sequencing has been completed for 26 samples and the rest of the samples are being sequenced.

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

The Virus Research and Diagnostic Laboratory (VRDL) at ICMR-NIRBI is a regional laboratory established in 2015 under the auspice of VRDL Network under the DHR, MOH&FW, with the objectives of creating infrastructure for the timely identification of viruses and agents causing epidemics, developing capacity for identification of novel viruses, developing diagnostic kits, providing training to healthcare professionals, and undertaking research for identification of emerging and re-emerging agents. A total of 16,542 samples were screened at VRDL for more than 30 viruses and other pathogens of public health importance:

Table 6 Number of samples tested at VRDL

Sl. No.	Investigations Performed	Total No. of samples tested from April 2024 to Mar 2024	Positive Samples	Positivity (%)
1.	Dengue NS1 ELISA	4200	172	4.10
2.	Dengue IgM ELISA	2963	346	11.68
3.	Chikungunya IgM ELISA	657	78	11.87
4.	Chikungunya PCR	1	1	100.00
5.	Zika Virus PCR	0	0	0.00
6.	JE Virus IgM ELISA	697	48	6.89
7.	Hepatitis A IgM ELISA	601	237	39.43
8.	Hepatitis E IgG ELISA	583	28	4.80
9.	Hepatitis B surface Ag ELISA	408	14	3.43
10.	Hepatitis C Ab ELISA	425	20	4.71
11.	Influenza A - H1N1 PCR	6388	139	2.17
12.	Influenza A – H3N2 PCR	6388	156	2.44
13.	Influenza B- Yamagata PCR	6388	0	0.00
14.	Influenza B- Victoria PCR	6388	338	5.29
15.	Respiratory RSV –A PCR	5998	29	0.48
16.	Respiratory RSV –B PCR	5998	290	4.83
17.	Respiratory hmPV A1A2 PCR	5998	102	1.70
18.	Respiratory PIV PCR	5998	349	5.82
19.	Respiratory Adenovirus PCR	5998	825	13.75
20.	Respiratory Rhinovirus PCR	5998	1270	21.17
21.	SARS-CoV-2 PCR	1221	189	15.48
22.	Scrub typhus IgM ELISA	3605	291	8.07
23.	Leptospira IgM ELISA	1499	110	7.34
24.	Monkey Pox PCR	3	0	0.00
25.	VZV PCR	3	1	33.33
26.	HSV PCR	29	1	3.45
Total Testing Done		**52786**		
Total Samples Received		**13503**		

Research activities are ongoing on molecular characterization of the respiratory syncytial virus (RSV), respiratory adenovirus, and acute hepatitis virus.

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 VRDL-NIRBI under this project and the laboratory is now equipped to initiate isolation, antigenic characterization, and gene sequencing of Influenza viruses. A total of 922 severe acute respiratory illness (SARI) and 333 influenza-like illness (ILI) samples were collected from six hospitals and four community settings respectively. The project has started to screen RSV as part of the surveillance of under 5-year children after IEC approval and to date, 94 paediatric SARI cases have been recruited.

Sustainable Laboratory Network for monitoring of Hemorrhagic Fever Viruses in India and enhancing bio-risk mitigation for risk group pathogens (under VRDL network)

A total of 4,229 Serum samples received in NIRBI-VRDL were screened for haemorrhagic viruses like Dengue, Chikungunya, Leptospira and Scrub typhus and 49 serum samples negative for these tests were sent to NIV-Pune for further screening.

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

A total of 26 *A. baumannii*, 30 *Pseudomonas aeruginosa*, 45 *Salmonella* Typhi, 16 non typhoidal *Salmonella*, 25 *Staphylococcus aureus*, 14 coagulase-negative *Staphylococcus*, 25 *Enterococcus faecalis* and 20 *Enterococcus faecium* were received from CMC Vellore, AIIMS New Delhi and JIPMER Puducherry.

PCR results showed carbapenemases including *bla*NDM, *bla*OXA-23, *bla*VIM and *bla*IMP were high among *A. baumannii* (55-90%) compared to *P. aeruginosa* (13 to 66%). Prevalence of ESBL (*bla*PER) was low among *A. baumannii* (23%) but 92% *A. baumannii* possessed *armA* (16S rRNA methylase). None of the *P. aeruginosa* possessed ESBLs, AmpC β-lactamase and 16S rRNA methylases. *P. aeruginosa* possessed OXA-198 class D β-lactamase involved in carbapenem resistance. Low resistance was detected among *Salmonella spp*. (15-20%) possessing *bla*TEM; SulI, Sul II, QnrB etc. MecA was detected among 64% of *S. aureus*. WGS was carried out for 96 isolates including *E. coli* (n=13), *K. pneumoniae* (n=16), S. Typhi (n=7), NTS (n=19), *Shigella spp* (n=7), *A. baumannii* (n=8). *P. aeruginosa* (n=8) and *S. aureus* (n=18). WGS analysis showed most of the *Salmonella spp* received from CMC, Vellore during 2019 possessed *qnrS1, qnrB1 & aac(6')-Ib-cr* as plasmid-mediated fluoroquinolone resistance determinants, blaCMY-2 as plasmid-mediated *ampC, and bla*CTXM-15 as ESBL along with *tet(A), fosA7, sul1 & sul2, catA1 &catB3 and dfrA14*. 7 isolates of *K. pneumoniae* were detected as hypervirulent among which 2 were carbapenem-resistant possessing *bla*OXA-181 which was also detected in 3 isolates of *E. coli*. High prevalence of *mecA* and *ermC* along with *blaZ* was detected among S. aureus by WGS.
Papers were presented in two conferences:
1. Roy S, Majumdar A, Dutta S. Multidrug-resistant Gram-negative organism archived at National Repository of Antimicrobial Resistant Bacteria (NRAMRB): The first National Antimicrobial Resistance Hub of India. Exploring the Bioresources of India to fight against Antimicrobial Resistance (AMR), Kolkata, April 4-5, 2024.
2. Roy S, Majumdar A, Dutta S. National repository of antimicrobial resistant bacteria (NRAMRB) for addressing AMR research across India. 46th Microcon, Lucknow, November 23-26, 2023

HIV laboratory services under NACP-V

Integrated Counselling & Testing Centre (ICTC) of ICMR-NIRBI is key entry point that provides services in an integrated manner, testing and prompt delivery of test results with embedded quality assurance, ensuring audio-visual privacy and confidentiality. NACO-National Reference Laboratory of ICMR-NIRBI plays an important role to conduct External Quality Assurance Scheme for 12 state reference laboratory and their attached ICTCs where HIV testing being performed direct from the patient. Molecular diagnosis of HIV among babies (up to 18 months) born to HIV infected mothers is being done at ICMR-NIRBI Regional Reference Lab (RRL), employing state-of-art molecular assay for 14 states of East and North-Eastern India. HIV Viral Load Testing lab of ICMR-NIRBI plays a significant role in making decisions regarding initiation or changes in antiretroviral therapy by ensuring efficacy of ART and taking evidence-based decision for initiation of further treatment. Another service provided by Consortium Laboratory, ICMR-NIRBI is to conduct evaluation of HIV, HBV & HCV diagnostic kits to ensure the quality as per CDSCO guidelines for transfusion transmitted infections, before using in field as a public health importance.

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

Topic of Trainings/ Conferences/ Seminars/ Webinars etc.	Conducted By	Period	
		From	To
• ePost Graduate Program in Epidemiology	Indian Institute of Public Health Delhi	03 Jan 2023	31 Dec 2023
• 123rd C-CAMP InDx Round Table Meeting	Centre for Cellular and Molecular Platforms	01 Apr 2023	01 Apr 2023
• Good Clinical Practice and Regulations in Clinical Research in India	ICMR-NIRBI	05 Apr 2023	05 Apr 2023
• Biological Safety Awareness	ESCO Lifesciences Group	25 Jul 2023	25 Jul 2023
• PhD Coursework under Dept. of Life Sciences and Biotechnology	Jadavpur University	Aug 2023	Nov 2023
• Serology and Molecular EQAS Panel Production	NRL-Australia and ICMR-NIV	21 Aug 2023	29 Aug 2023
• Regional ToT of IBBS HRG	ICMR-NIRBI and NACO	28 Aug 2023	04 Sep 2023
• Intellectual Property for Scientists	ICMR HQ	14 Sep 2023	14 Sep 2023
• Government e-Market Place GeM	ICMR HQ	05 Oct 2023	05 Oct 2023
• Science Communication for Scientist	ICMR HQ	19 Oct 2023	19 Oct 2023
• Regional ToT of IBBS – PLHIV	ICMR-NIRBI and NACO	20 Nov 2023	22 Nov 2023
• Tuberculosis Epidemiology in India" & "Molecular Diagnostics in Tuberculosis	ICMR-NIRBI	20 Dec 2023	20 Dec 2023
• Controlling Viral Gastroenteritis: From Gut Microbiome to Vaccines	ICMR-NIRBI	30 Jan 2024	30 Jan 2024
• An Introduction to Evidence-Based Medicine & GRADE Methodology	ICMR HQ	12 Feb 2024	12 Feb 2024
• Exploring the Spectrum: Neonatal Sepsis in Focus	ICMR-NIRBI	29 Feb 2024	29 Feb 2024
• Understanding the role of social media in scientific and research communication	ICMR HQ	07 Mar 2024	07 Mar 2024

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

Progression of retinal choroidal neovascularization (CNV) by latent human cytomegalovirus infection and immunological signalling among neonatal patients admitted tertiary care hospital

Objective

- Understanding the clinical impact of latent HCMV infection(H+) on neonatal patients with retinal choroidal neovascularization (R+).
- Comparing non-pathological retinal choroidal neovascularization with HCMV-induced retinal neovascularization can aid in identifying immunological changes and developing effective treatments. (study groups: R+,H-,R-,H+, R+,H+, R-H-)

Outcome:

The objective of this study is to discover distinct immunological variances in neonates with HCMV-triggered retinal neovascularization, as well as assess modifications in retinal angiogenesis. In patients with R+,H+, HCMV-induced CNV displays no noteworthy inflammatory activation at first. However, elevated levels of TGF-β and viral load could serve as a predictive biomarker. As CCL-5 was found to be insignificant during the initial stages of R+,H+ patients, it is possible that another pathway delayed CNV progression despite the persistent presence of HCMV infection (Fig 33). In the R+,H- group, there is an increase in angiogenesis through the activation of CCL-5 mediated by AT1R, while in the R+,H+ group, there is an overexpression of AT2R that causes unique variations in angiotensin signaling. This, in turn, elevates the expression of CCL-19, CCL-21, and CXCL-12. It has been discovered that when comparing chemokines, patients of R+H- grouped showed a significant increase in both CCR5 and CCR-7 expression in the R+,H+ group. For R+,H- patients, CNV progression leads to activation of the NFκB canonical system, while the non-canonical NFκB signaling system has been found to be significantly active in the R+,H+ group (Fig 34). Individuals belonging to R+ and H+ categories may experience a delayed development of cytomegalovirus-induced cytomegalovirus retinitis (CNV) during the initial stages of the infection. This delay may occur due to a decrease in pro-inflammatory cytokines and an increase in anti-inflammatory cytokines. HCMV infection may cause angiogenesis after antiviral treatment due to increased inflammatory chemokine markers and non-canonical NFκB stimulation. It has also observed that pathogenic CNV is associated with delayed pro-inflammatory cytokines expression and AT2R-dependent disease progression.

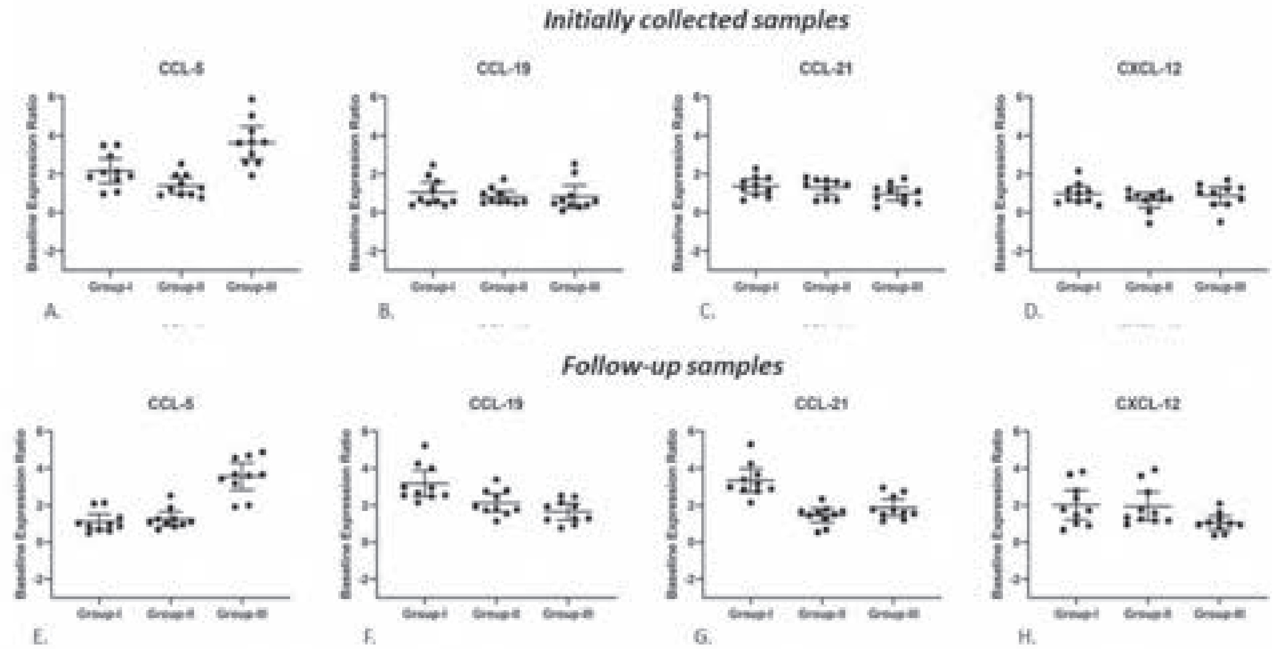


Fig 33: Relative m-RNA expression of selected chemokines in PBMC's from patients samples of group-I(R+,H+),II (R-,H+) and III (R+,H-) (N-10). expression ratio had been calculated with respect to group-IV (R-,H-) (control group; N-10) in terms of fold change ($2^{-\Delta\Delta Ct}$) were estimated by quantitative PCR. GAPDH were chosen as internal control. (The relative m-RNA expression of control group was chosen as +1 value in Y axis) Figure A-D- chemokine expression of initially collected samples; Figure E-H- follow up analysis of the same chemokine after 2 months of preliminary investigation.

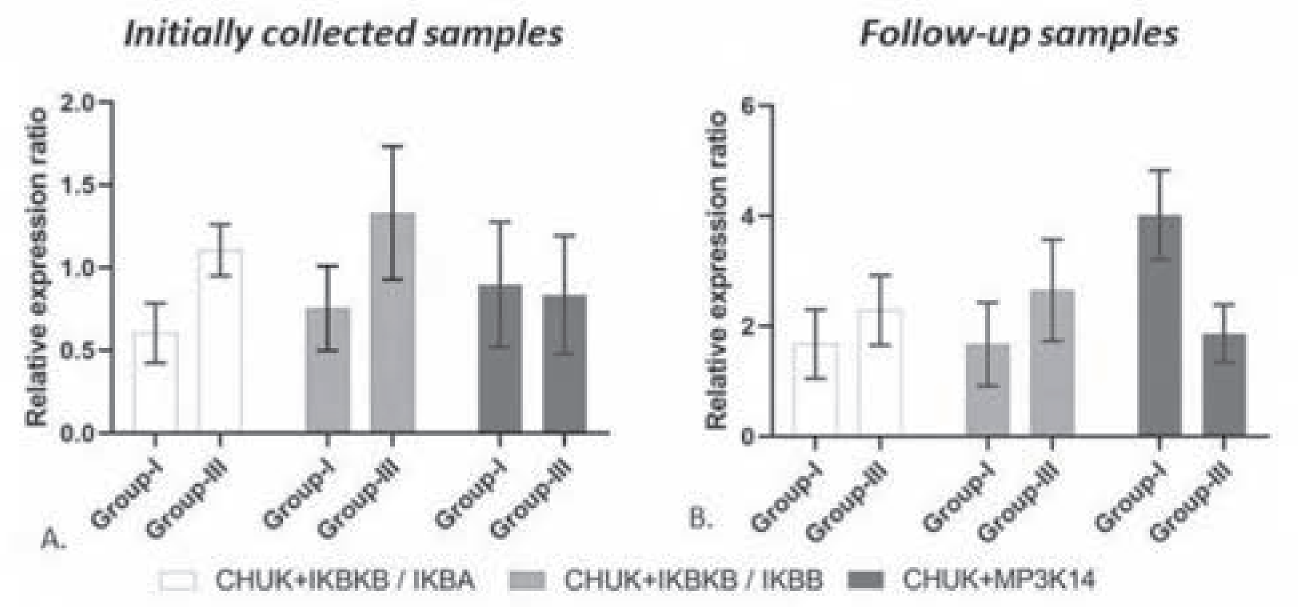


Fig34: Relative m-RNA expression ratio NFκB signaling pathway genes [canonical- (CHUK+IKBKB)/IKBA and (CHUK+IKBKB)/IKBB gene expression and Non-Canonical-CHUK+MP3K14] in PBMC's from patient's samples of Group-I (R+,H+)and III(R+,H-) (N-10). Expression ratio had been calculated with respect to group-IV (R-.H-) (control group; N-10) in terms of fold change ($2^{-\Delta\Delta Ct}$) were estimated by quantitative PCR. GAPDH were chosen as internal control. **Figure A-** representing the expression pattern in initially collected patient samples; **Figure B-** representing the follow up analysis of the same patients after 2 months.

A Decade-Long Cohort Analysis of Human Cytomegalovirus (HCMV) Induced Early and Late Renal Rejection Post-Transplant Patients in the Eastern Indian Population

Objective:

- The objective of the research was to comprehend the effect of late HCMV infection on renal rejection by examining specific clinical parameters in the Eastern Indian cohort.

Outcome:

We studied the link between early and late renal rejection caused by HCMV infection in the Indian sub-population. Based on our comprehensive analysis, our findings revealed that high HCMV viremia during early renal rejection (< 2 yr.) can significantly impact our study cohort without any apparent symptoms except for urinary tract infections. Our analysis of patient cohorts revealed that those who experienced early rejection had a significantly higher HCMV viral load of 7.84+0.89 log copies (~5600-7850 DNA copies/µg) compared to non-rejected patients. Similarly, patients in the late rejection category initially showed similar ranges of DNA viremia, but antiviral therapy resulted in reduced viremia levels. However, a gradual and significant elevation (data not shown) was observed in late renal rejected patients (> 2 years) with 2.96+0.94 log copies (~1670-3809 DNA copies/µg) at the time of rejection. In cases of early renal rejection, patients showed significantly high levels of HCMV pp65 antigenemia, indicating HCMV viremia. Antigenemia assay was performed throughout antiviral therapy until no HCMV-infected leukocytes were observed. Quantitative estimations of HCMV viral copies were carried out even after getting no HCMV-positive leukocytes, indicating latent HCMV infection may be playing a critical role in late renal rejection **(Table 7).**

Table7: Quantitative comparison of selective risk factors among the CMV infected renal rejected and non-rejected patients. The data has been calculated by the Mean±SD followed by student t-Test of the following groups.

		Less than Two Years after the Transplant (Early Rejection)				More than two Years after the Transplant (Late Rejection)			
		Mean ±SD	P Value	95% CI Upper	95% CI Lower	Mean ±SD	P Value	95% CI Upper	95% CI Lower
Antigenemia (no of cells/250000 leukocytes)	Renal Rejection	9.15±2.41	0.030	-4.194	-0.225	1.71±1.05	0.224	-0.850	0.208
	No Rejection	6.94±2.98				1.39±0.62			
CMV viral load (DNA log copies/µg)	Renal Rejection	7.84±0.89	0.007	-0.509	-0.343	2.96±0.94	<0.001	-1.986	-0.987
	No Rejection	6.34±1.08				1.47±0.71			
CD-4+ Cell count	Renal Rejection	515.68±261.9	0.384	-279.20	110.34	460.36±252.10	<0.001	121.94	411.48
	No Rejection	430.34±261.3				827.24±243.78			
Creatinine level (mg/dL)	Renal Rejection	1.57±0.76	0.331	-0.756	-0.267	2.62±0.81	<0.001	-1.794	-0.912
	No Rejection	1.33±0.53				1.26±0.67			

22 out of 79 patients did not respond to the treatment, and an increase in the HCMV viral load resulted in renal rejection. A reduction in CD4+ cell counts coincided with an ongoing cytomegaloviral infection. Our study found that late renal rejection caused a decrease in CD4+ counts and an increase in creatinine concentration, which could be a significant risk factor for late renal rejection. HCMV viremia was also found to be a risk factor. Urinary tract infections were persistent in both early and late renal rejection cases, while hematuria and diabetes were predominately significant in later cases.**(Table 8)**

Table 8: Regression analysis of CMV-positive renal rejected patients (>2 years of transplant) in comparison to different risk factors

	Renal Rejection of CMV-Positive Samples more than Two Years					
	Univariate Test			Multivariate Test		
Risk Factors	**Odds Ratio**	**95% CI [Lower-Upper]**	**P value**	**Odds Ratio**	**95% CI [Lower-Upper]**	**P Value**
Positive donor before transplant	0.91	0.59-1.39	0.669			
Positive recipient before transplant	0.87	0.66-1.15	0.357			
Symptomatic patients	1.02	0.60-1.74	0.934			
Symptoms						
Fever	0.75	0.40-1.38	0.362			
Pneumonia	0.82	0.43-1.56	0.562			
Hematuria	1.92	0.99-3.75	**0.032**	8.30	1.23-55.80	**0.029**
Leukopenia	2.25	0.97-5.20	**0.036**	3.52	0.52-23.52	0.193
Diabetes	2.70	1.19-6.09	**0.005**	9.33	1.24-70.01	**0.023**
Diarrhea	1.37	060-3.11	0.436			
UTI	2.01	0.94-4.22	**0.047**	2.14	0.33-13.59	0.419
Biochemical parameters						
SGPT	0.75	0.36-1.55	0.441			
Alkaline phosphatase	0.67	0.33-1.36	0.271			
creatinine level	2.35	1.24-4.44	**<0.001**	9.43	1.35-65.59	**0.023**

In-silico analysis of antiviral responses from ethnomedicinal compounds against Human cytomegalovirus

Objective:

- Discover new therapeutic approaches by using different medicinal mushrooms and decipher the mode of action of the suitable bioactive compounds against HCMV infection *in vitro* conditions
- Decipher the probable mode action of the selective bioactive compounds against clinical HCMV isolates by *in silico* method.

Outcome:

After extensive previous research of our lab, *Pleurotus sp.* and *Lentinus sp.* mushrooms were effective against HCMV on MRC5 and reporter cell lines. They reduced the viral load by 75% under in-vitro conditions. The Pleurotus sp. extract showed 100% inhibition of HCMV replication at 150 µg/ml, while the crude Lentinus sp. extract exhibited the same result at 130 µg/ml. So in recent investigation, we have been able to successfully cultured these mushrooms in a controlled environment and various extracellular enzymes were isolated from 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 and UL-54) has been studied thoroughly by both time dependent and dose dependent manner by using EC-50 concentration of the Laccase enzymes on different cell lines. In all these cases the enzymes showed promising antiviral responses.

In-silico analysis of the Laccse enzyme showed three peripheral different docking sites with one surface catalytic domain. All such peripheral domains were showed 67 to 73 % active protein protein interactions to HCMV major tegument proteins such asUL-54 through molecular simulation studies performed by Autodock Vina 4.2.0 > Molecular dynamics simulation reported that Laccase enzyme extracted from mushroom extracts were able to successfully bind at the active site of the viral DNA polymerase (UL-54) at around -7.6 Kcal/mol which is comparatively higher in respect to commercially available drugs -6.8 Kcal/mol and this enzyme also found to be effectively inhibit the viral DNA polymerase's conserve region in a water solvent biosphere at 1.23 ug/ml concentration.(Fig 35)

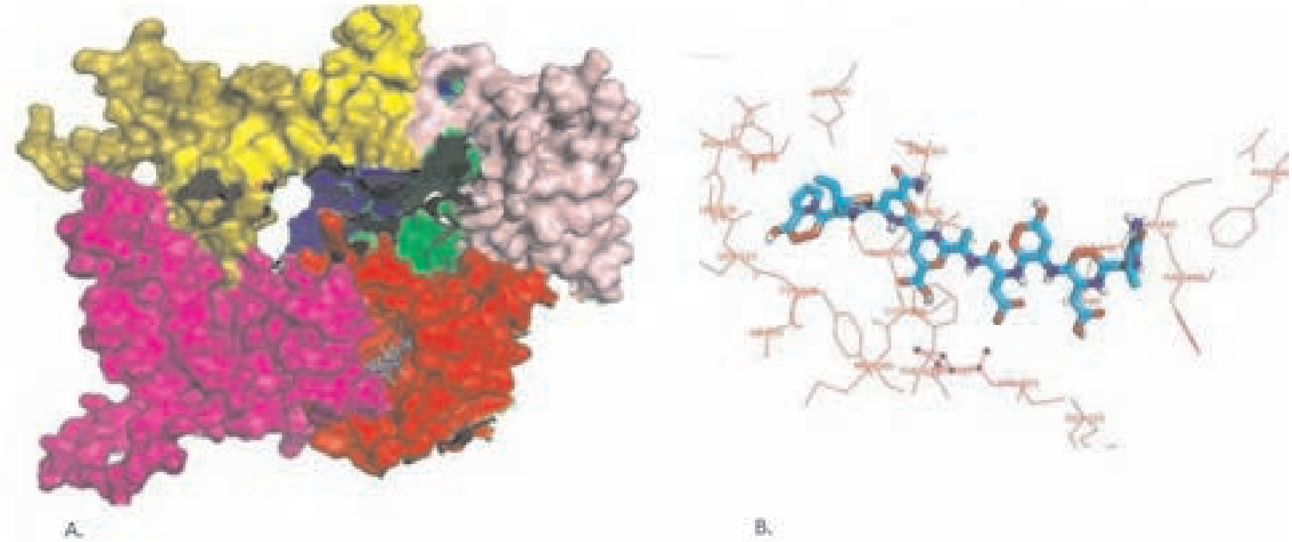


Fig 35: Representative picture of antiviral docking result of Laccase enzyme on HCMV DNA polymerase, (A) Enzyme laccase [in cyan] bounded efficiently at the viral DNA polymerase exonuclease sitte [in Red]. (B) amino acid association of the drugs in the close proximity at the docking region.

Molecular identification and phylogenetic analysis of chikungunya virus among dengue negative patients in Kolkata, India

Objective:

- Understand the clinical variability and progression of chikungunya infection for better diagnostic approaches.

Outcome:

To help doctors diagnose dengue and chikungunya infections more quickly and effectively, we conducted a study in Kolkata to identify the prevalence of chikungunya among those who tested negative for dengue. Both diseases share many similar symptoms, so we used molecular testing to confirm chikungunya infection and analyzed the clinical manifestations of patients with the virus. We collected samples from suspected dengue patients between January 2020 and December 2021 and used ELISA and RT-PCR methods to confirm the presence of chikungunya in those who tested negative for dengue.

Our analysis included comparing the clinical classifications, identifying disease aetiology using clinical and laboratory factors, and evaluating the time course of several clinical variables. We found that chikungunya infection was present in 15.1% of patients as determined by ELISA, and 6.3% as determined by RT-PCR (Fig 36) Patients with chikungunya infection were more likely to have arthritis and myalgia at the time of hospital admission, while symptoms such as conjunctivitis, photosensitivity, arthralgia, anorexia, fatigue, retroorbital pain, vomiting, dermatitis, or swollen glands were common to both diseases.

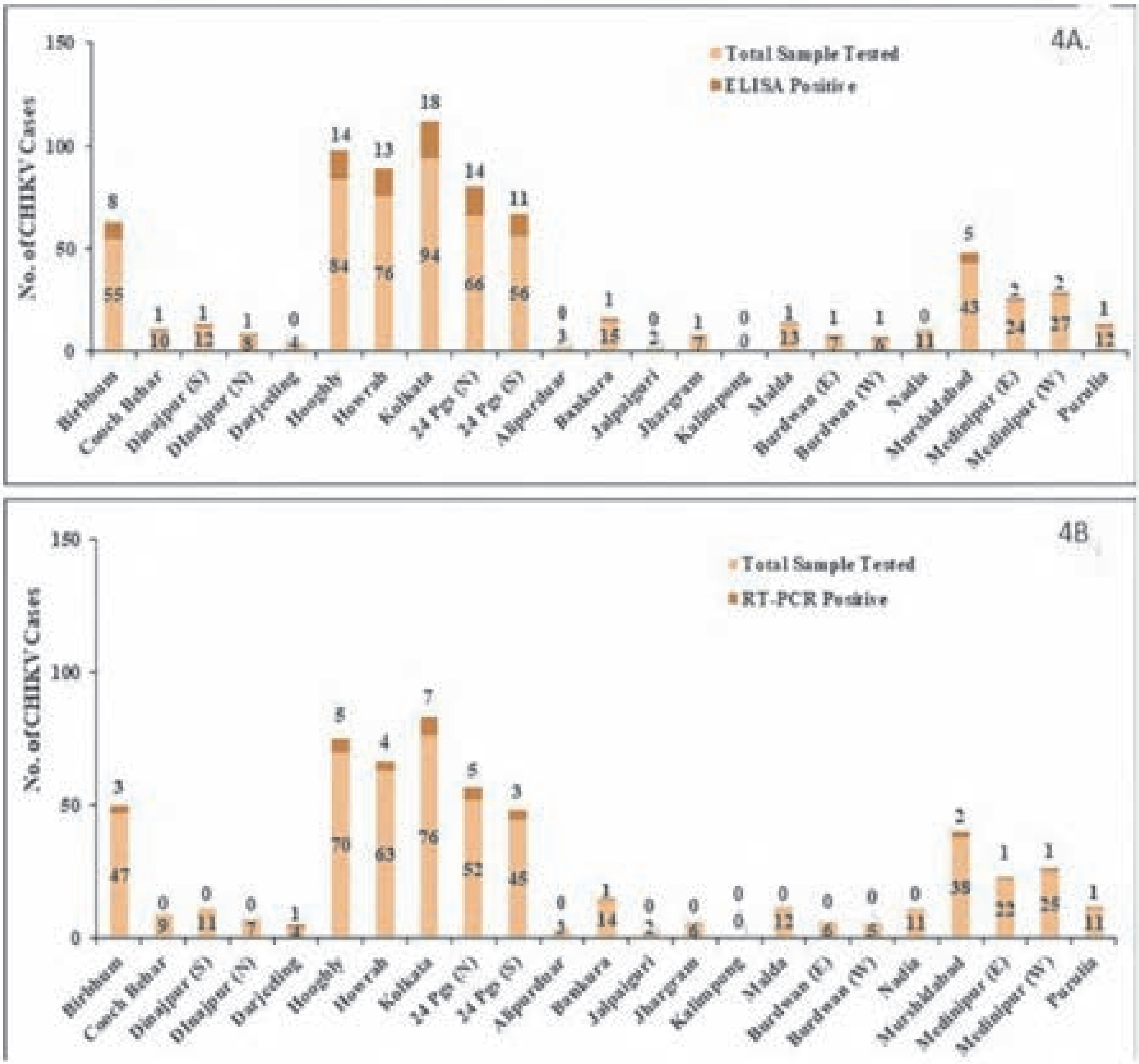


Fig 36: District-wise distribution of CHIKV cases based on ELISA (4A) and RT-PCR(4B). In this figure, we have analysed the district-wise prevalence rate of CHIKV by considering the total number of CHIKV sample tested and the samples showed positive results in both ELISA and RT-PCR assay. The samples showed ELISA positive results for CHIKV were not considered further for RT-PCR assay

Surveillance of Foodborne pathogens from North-East India

Principal Investigator: Dr. T. Ramamurthy, INSA-Senior Scientist

Objective:

- Identify the pathogens causing foodborne diseases and outbreaks
- Document regional and seasonal differences in the incidences of certain bacterial, viral and parasite-mediated foodborne diseases

- Genotyping and antibiotic sensitivity pattern of identified bacterial pathogens
- Designate the transmission pathway of different foodborne diseases

Outcome:

When faced with diarrhoeal outbreaks, it is crucial to test suspected foods for enteric pathogens. However, many labs still rely on conventional culture methods, which can be slow and hinder proper infection management. Additionally, not all labs possess the necessary facilities and expertise for this type of testing. Thankfully, a duplex real-time SYBR green PCR assay has been developed, capable of detecting a wide range of food- and waterborne pathogens (including EPEC, EIEC, EHEC, EAEC, ETEC, Salmonella spp., Shigella spp., Y. enterocolitica, Y. pseudotuberculosis, Campylobacter jejuni, Vibrio cholerae, Vibrio parahaemolyticus, Vibrio vulnificus, Aeromonas spp., Staphylococcus aureus, Clostridium perfringens, and Bacillus cereus) in stool samples. This kit can detect as little as 105 pathogenic bacteria per gram of stool. Other kits for detecting Salmonella spp, Salmonella, Vibrio parahaemolyticus, and Listeria spp. from various food and environmental samples had detection limits ranging from 103 to 105. The Gastrofinder real-time PCR kit had a detection limit ranging from 102 (EPEC, STEC, Y. enterocolitica) to 104 (Salmonella spp.), making it a superior option compared to other kits.

Conferences / Seminars /Workshops / Meetings / Trainings Attended

- Attended the two day (April 4 & 5, 2024) AMR Conference 2024 organised by BRIC and ICMR NIRBI.

Post and Pre-doctoral Fellows

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

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

HCV drug resistance and DAAs non-response studies among hosts using Multi-omics approaches:

Our research team is keen on understanding Hepatitis C viral mutations associated with direct-acting antiviral response to HCV circulated in Eastern India. A critical NS5B-associated RAS S282T was identified among GT-3b non-responder patients for the first time. Hepatitis C virus NS5A gene associated Resistance Associated Substitution (RAS), V31M, is the most common circulating mutation among GT-3b infected both treatment naïve and non-responder patients in the Eastern region. Given the high frequency of GT-3a in India, patients who had not yet received treatment also have NS5B-related RASs, which include mutations such as L159F, C316F, Y448D, and G556R. Treatment response may be prospectively predicted by these RASs in treatment naïve patients. However, considering the role of host immune factors in chronic infections, overlooking the host factors could have left a research gap in the complete understanding of direct-acting antivirals (DAAs) response in HCV-infected patients. Our research team has laid the first step in understanding possible host factors mediating response to DAAs. We have initiated standardizing the protocol for identifying host factors contributing to treatment failure by transcriptomic and proteomic profiling.

Early detection of host biomarker(s) for severe dengue cases:

Our study highlights the potential of proteomics in unravelling biomarkers associated with severe dengue. This study indicates not a single protein, but a panel of protein molecules differentially expressed in severe dengue. Several signaling pathways and biomolecules are involved in endothelial cell dysfunction, especially from dengue fever to severe dengue cases. Proteomics data analysis indicated phase-specific deregulation of proteins biomolecules such as Apo lipoprotein, Cadherin, VEGF, FGFR1, VCAM, IRF3, IFN-γ, Fibronectin, IGFBP2, Angiopoietin and LBP. The identified biomolecules panel holds promise for improving diagnostic accuracy, risk stratification, and therapeutic interventions in severe dengue patients. This phase-specific (acute, intermediate/critical and recovery/ death) study uniquely helps in developing signature molecular profiles for early detection of severe dengue, patient management and drug designing.

Pan-India antigenic characterization of dengue viruses:

India, in spite of being a hotspot for dengue infections, has a limited data on genotypic characterization and understanding of the dengue virus. To gain insight of our study, we have successfully attempted and amplified the whole envelope gene of dengue virus serotype 3 (DENV 3). Sequencing analysis of 65 complete dengue envelope gene isolated from 2016 to 2019 for their evolutionary dynamics, we identified 61 were DENV 3 genotype III (93.84%) and 4 DENV 3 genotype I (6.16%), which were isolated in the year 2019. After reviewing the literature, we suspect that DENV 3 Gen I have newly emerged in India and calls for in depth molecular investigation.

Mutational analysis with reference strain available from NCBI (NC_0001475) and vaccine strains (Dengvaxia and TV003) showed antigenic differences in the envelope region. Particular variations i.e. A219T and E404A with reference strain, N147D, D154E and V478I with Dengvaxia strain and H90Y with TV003 strain were observed. Among these, A219T and D154E falls under probable epitope candidates which might evoke poor vaccine efficacy against dengue virus in India. If DENV 3 Gen I has newly emerged in India in 2019, then tracking it from 2018 till 2023 will help us determine its altered genetic structure, antigenicity, disease outcome and transmissibility.

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

- Attended workshop on "Detection of Hepatitis Virus A and E from water and food samples" organized by ICMR-NIRBI in collaboration with CDAC. August 8-9, 2023.
- Attended workshop on "Capacity Building in Systematic Review" Organized by ICMR-NIRBI in collaboration with WHO, July 11-14, 2023.
- Attended National workshop on "Good Clinical Practice & Regulations in Clinical Research-2023 (NWGCP & RCH 2023), ICMR-NIRBI, Kolkata, April 5-6, 2023.
- Attended 7th Edition of Molecular Virology Conference, Organized by Biological Sciences Division of the IISc. India, September 22-23, 2023.
- Attended workshop on Conducting a literature review: With special emphasis on prevalence meta-analysis, Organized by ICMR-NIRBI, Kolkata, August 24, 2023.

Post and Pre-doctoral Fellows

Post-Doctoral Fellow

Dr. Moumita Majumdar (ICMR-RA)

Dr. Uttaran Bhattacharjee (Project RA)

Pre-Doctoral Fellow

Mr. Supradip Dutta, SRF-Project

Ms. Upasana Baskey, SRF

Ms. Priya Verma, SRF

Mr. Sagnik Bakshi, SRF

Ms. Raina Das, SRF

Ms. Shreyasi Nath, SRF

Ms. Anwesha Ghosh, JRF

SERVICES PROVIDED BY THE INSTITUTE

NABL Accreditation

ICMR-NIRBI provides quality medical laboratory service to comply with ISO 15189:2012 standards. This year, the Institute was accredited by NABL as per ISO 15189:2012 "Medical laboratories - Requirements for quality and competence" since 2016. ICMR-NIRBI is accredited for twenty-eight (28) analytes under molecular testing and microbiology & infectious disease serology. Culture, identification and antibiotic susceptibility testing from blood, stool and rectal swabs and Widal test from blood serum fall under the scope of the clinical bacteriology laboratory.

WHO Prequalification of in vitro diagnostic medical devices

Prequalification of in vitro diagnostic medical devices (IVDs) is intended to promote and facilitate access to safe, appropriate and affordable IVDs of good quality in an equitable manner. The focus is on IVDs for priority diseases and their suitability for use in resource-limited settings. The prequalification performance evaluations are conducted, in accordance with standardized WHO performance evaluation protocols, by one or more laboratories that WHO has designated for conducting performance evaluation for one or several types of IVDs (referred to as a Performance Evaluation Laboratory (PEL)). Currently, 15 laboratories have been listed as PEL. ICMR-NIRBI has been listed as a WHO Pre-Qualification Evaluating Laboratory for the analyte *Vibrio cholerae* antigen and HIV antigen/antibody since 2019. Under this program evaluation for Vibrio cholerae rapid diagnostic test kit has been performed and clinical specimen panel for HIV serology assays have been prepared.

Diagnostic services of Regional VRDL:

Pathogen/Disease	Parameter Tested	Principle of Test
Dengue	Dengue NS1 Antigen	ELISA
	Dengue IgM Antibody	
	Dengue IgG Antibody	
Chikungunya	Chikungunya IgM Antibody	ELISA
	Chikungunya viral RNA	Real Time PCR PCR
Zika	Zika viral RNA	Real Time PCR PCR
Japanese Encephalitis	Japanese encephalitis IgM Antibody	ELISA
Hepatitis	Hepatitis A virus IgM Antibody	ELISA
	Hepatitis E virus IgM Antibody	
	Anti-Hepatitis C virus Antibody	
	HBsAg	
Influenza	Influenza A viral RNA	Real Time PCR
	Influenza A - H1N1 viral RNA	
	Influenza A - H3N2 viral RNA	
	Influenza B viral RNA	
	Influenza B - Yamagata viral RNA	
	Influenza B - Victoria viral RNA	
COVID-19	SARS-CoV-2	Real Time PCR

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

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

At NRAMRB, a web portal has been developed to showcase the activity and list the strains which will be available for the researchers. The NGS facility housing the ION S5 GeneStudio Next Generation Sequencing machine for whole genome sequencing and analysis of the strains. The following 5 clinical isolates of AMR bacterial strain were shared on request of CSIR - Indian Institute of Integrative Medicine, Jammu: *P. aeruginosa* - 05, *S. aureus* – 06. A sum of ₹5,500/- has been generated from this activity.

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. Being a member of Consortium labs, ICMR-NIRBI is engaged in Quality assurance of HIV, HBV & HCV diagnostic kit, which is routed through Consortium secretariat, ICMR-NARI, Pune.

- Consortium Laboratory, ICMR-NIRBI conducted evaluation of HIV, HBV & HCV diagnostic kits to ensure the quality as per CDSCO guidelines.
- Harmonization in the workflow of Consortium Laboratory, ICMR-NIRBI, ensures to obtain good quality diagnostic kits in the field as a public health importance.

Kit Evaluation by Consortium of NRLs, ICMR-NIRBI, Kolkata (April 2023 to March 2024):

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	08	08	08	08	08
HIV RAPID	54	54	48	53	48
HBsAg ELISA	06	06	06	06	06
HBsAg RAPID	01	01	01	01	01
HCV ELISA	06	06	06	06	06
HCV RAPID	07	07	00	07	00
TOTAL	**82**	**82**	**69**	**81**	**69**

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-NIRBI is the proficiency testing provider for HIV antibody testing for the States Reference Labs (SRLs) of A&N, Assam, Jharkhand, Meghalaya, Mizoram and Orissa.

Referral Services: National Reference Lab, NIRBI has been entrusted with the responsibility of verifying results for samples sent by Hospitals. Samples tested, result communicated within the turnaround time, analysed the root cause of discordance and trained the referring lab personnel for improvement and technical capacity building. Most of the samples are positive for HIV antibody indicating improvement of quality of the referring labs.

External Quality Assurance/ Confirmation of samples from SRLs/ NRLs (From April 2023 to March 2024)

Sl. No.	Source of Samples	No. of sample Tested	No. of sample Positive	Indeterminate at NRL
1.	SRL- G.B Pant hospital	01	NIL	01

Referral Service done for the institutions at NACO NRL, ICMR-NIRBI, Kolkata (From April 2023 to March 2024)

Sl. No.	Source of Samples	No. of sample Tested	No. of sample Positive
1.	ICTC, ICMR-NIRBI	27	27

HIV Sentinel Surveillance 2023 (ANC and Prison): NRL, ICMR-NIRBI (Testing Lab.), Kolkata (sample received and tested from April 2023 to March 2024)

Name of the site (Type)	Site code with Subsite	HIV		Syphilis		Hepatitis B		Hepatitis C	
		Tested	Result (Reactive)	Tested	Result (Reactive)	Tested	Result (Reactive)	Tested	Result (Reactive)
Abinash Dutta Maternity Home (ANC)	19335012-0	59	0	400	0	59	0	59	0
Jangipur Sub-Divisional Hospital (ANC)	19325021-0	0	0	400	0	0	0	0	0
Nabadwip State General Hospital (ANC)	19328011-0	68	0	401	0	68	0	68	0
Vidyasagar State General Hospital (ANC)	19335021-0	31	0	401	0	31	0	31	0
Aranghata BPHC (ANC)	19328012-1	0	0	202	0	0	0	0	0
Ranaghat Sub-Divisional Hospital (ANC)	19328012-2	0	0	200	0	0	0	0	0
Madhyamgram Rural Hospital (ANC)	19329021-1	50	0	200	0	50	0	50	0
Barasat Medical college & Hospital (ANC)	19329021-2	0	0	200	0	0	0	0	0
Berhampore Central Correctional Home (Prison)	19325131-0	160	0	400	0	160	2	160	0

HIV Sentinel Surveillance 2023 (ILC): NRL, ICMR-NIRBI (Testing Lab.), Kolkata (Sample received and tested from April 2023 to March 2024)

Testing Lab	No. of Samples received	No. of samples tested	No. of sample rejected	Result (Reactive)			
				HIV	Syphilis	Hepatitis C	Hepatitis B
Pasteur Institute, Shillong	386	386	0	44	109	50	34
Tura CH,Meghalaya	132	132	0	2	09	07	22
G.B Pant Hospital, A&N Island	90	90	0	1	0	0	12
GMCH, Gauhati	604	604	0	48	11	105	48
AMCH, Dibrugarh	170	170	0	4	0	0	7
SMCH, Silchar	140	140	0	14	0	6	22
SLNMCH, Koraput	178	178	0	13	23	11	31
MKCGMCH, Berhampore	194	193	1	02	24	4	61
MGMMCH, Jamshedpur	101	101	0	1	0	0	0
SCBMCH, Cuttack	552	552	0	24	01	03	29
RIMS, Ranchi	300	300	0	10	102	18	21
STM, Kolkata	181	181	0	5	12	5	21
SNMMCH, Dhanbad	237	237	0	12	2	1	24

HIV Sentinel Surveillance 2024 (IBBS): NRL, ICMR-NIRBI (Testing Lab.), Kolkata (Sample received from April 2023 to March 2024).

STATE	RECEIVED	REJECTED
West Bengal	1028	01
Mizoram	390	01

HIV Sentinel Surveillance 2024 (HRG): NRL, ICMR-NIRBI (Testing Lab.), Kolkata (Sample received from April 2023 to March 2024)

STATE	RECEIVED	REJECTED
Meghalaya	819	5
Mizoram	1651	4
Chattisgarh	0	0
Tripura	810	2
Nagaland	50	0

Proficiency Testing Program:

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

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

Integrated Counseling & Testing Centre (ICTC)

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

The main functions of the ICTC include:

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

HIV testing details at ICTC, ICMR-NIRBI (April 2022- March 2023):

Total Tested	Positive	Positivity	HIV-TB Co-Infection	Client initiated Tested	Provider Initiated Tested
1165	25	2.14%	0	700	465

HB$_s$Ag, HCV, VDRL testing details in ICTC, ICMR-NIRBI (April 2022-March 2023):

Tests	HbsAg	HCV	VDRL
Total Tested	382	386	16
Total Positive	03	19	04

A high standard of testing is maintained at ICTC by using 3 test principles for diagnosing HIV. ICMR-NIRBI ICTC secured 100% concordance result in external quality assurance scheme (EQAS) through State Reference Laboratory.

From April 2023 to March 2024 total 680 clients were tested for HIV in ICTC. Among them11 were found positive (Figure: 1). 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 center and NTEP if required.

Certificate of Excellence

ICTC of ICMR-NIRBI has achieved 5-star quality of Standard by maintaining consistently high standard of quality in HIV testing as per the evaluation of National AIDS Control Organization.

Plasma Viral Load Assay of HIV

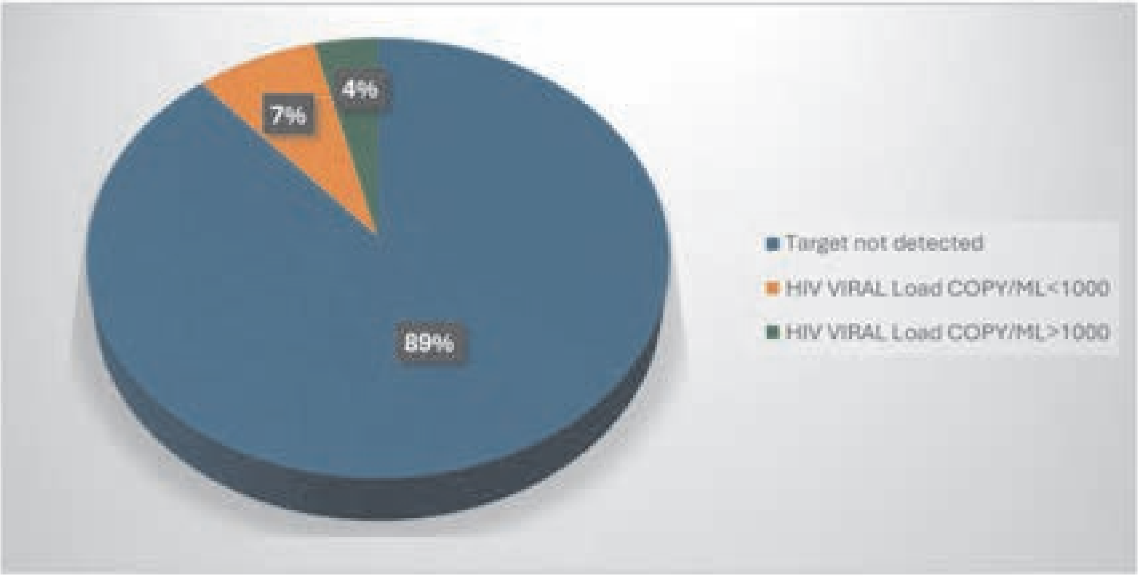
HIV Viral load assay under NACO, is being conducted at ICMR-NIRBI – Molecular HIV Laboratory, for ensuring efficacy of ART and taking evidence-based decision for initiation of further treatment. Quantitative measurement of HIV level in peripheral blood has greatly contributed to the understanding of the pathogenesis of HIV infection and has been shown to be an essential parameter in prognosis and management of HIV infected individuals. Decisions regarding initiation or changes in antiretroviral therapy are guided by monitoring plasma HIV RNA levels (viral load). The goal of antiretroviral therapy is to reduce the HIV virus in plasma to below detectable levels (below 1000 copies/ml of plasma which corresponds to a viral suppression and efficacy of the antiretroviral therapy).

ICMR-NIRBI is one of the Laboratories under NACO that uses Abbott RealTime HIV-1 RNA assay, which is an in vitro reverse transcription polymerase chain reaction (RT-PCR) assay for the quantization of HIV-1 in human plasma. ICMR-NIRBI Molecular HIV laboratory restarted HIV viral load assay for the patients under ART for monitoring effectiveness of on-going treatment as per national guidelines and also to assist in HIV drug resistance mutation assay.

Presently, **fourteen ART centers** (ARTC –Darjeeling, ARTC –Shiliguri, ARTC-Coochbihar, ARTC –Islampur, ARTC -Murshidabad, ARTC Maldah, ARTC-Bankura, ART-Nadia, ARTC-Hooghly, ARTC-Tamluk, ARTC-SSKM,ARTC-STM,ARTC-MR Bangur and ARTC-Sagar Dutta Medical College) of West Bengal are sending specimens to ICMR-NIRBI for HIV Viral Load test. Apart from these centres the **Centre of Excellence at STM** (West Bengal) is also sending specimens of PLHIV who are under SACEP review. **Two ARTCs from Arunachal Pradesh** (ARTC-Namsai and ARTC-Naharlagun) are also linked with this Viral Load laboratory for PVL testing. For the period of April 1st, 2023 to March 31st , 2024; **20,929** of Viral Load samples were received at ICMR-NIRBI, and a total of **19,539** samples were tested for HIV viral load during the particular period. In this period total 95.1% of viral suppression was observed (considering the TND and copy no<1000/ml viral load results).

Status of HIV Viral Load Assay for patients under ART for the period of April 1st 2023 to March 31st , 2024

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			
20,929	19,539	1466	756	17317



Representation HIV plasma viral load results in the period of April, 2023-March, 2024.

Quality Management by External Quality Assessment:

1. VLTL performed successfully in 2022-Round-II (received on 09.08.2023) of National External Quality Assessment Program (NEQAP); HIV-1 Viral Load using Dried Tube Specimens (DTS)

2. EID Lab successfully passed PT panel sent by CDC.

Training Of Staff

1. All staffs from Viral Load participated in the meeting on Experience Sharing & Review Meeting (ESRM) of Viral Load (VL) Labs under NACP- Kolkata (West Bengal) 27th and 28th Feb, 2024.

2. All staffs from Viral Load and EID divisions completed SOCH training programme conducted by WBSAP&CS on 15.01.2024.

3. The Technical Officer of the Viral Load Laboratory completed the one-day hands on training organised by NACO at Swasthya Bhawan on the key performance indicators (KPI) and the dashboards on 20.09.2023.

Early Infant Diagnosis (EID)

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

NACO-conducted EID Program is the cornerstone in the efforts to significantly reduce HIV related morbidity and mortality in infants. The diagnosis of HIV infection in infants and children younger than 18 months is different from that in adults due to trans-placental transfer of maternal antibodies from mother to child during pregnancy, childbirth and breast feeding. Hence, HIV-1 TNA (Total Nucleic Acid) PCR testing is recommended for the babies less than 18 months of age.ICMR-National Institute of Cholera and Enteric Diseases (NIRBI) is one of the 6 Regional Reference Laboratories (RRL) among AIIMS, ICMR-NIRBI, NITR, MUniv, NIMHANS & NARI, under NACO, performing RealTime HIV-1 Qualitative in vitro amplification assay for the qualitative detection of Human Immunodeficiency Virus Type 1 (HIV-1) nucleic acids from Dried Blood Spot (DBS) samples. In ICMR-NIRBI, EID program has been started from August, 2010 initially with three states, West Bengal, Orissa and Chhattisgarh. With gradual success of the program, the North Eastern states (Jharkhand, Bihar, Assam, Manipur, Mizoram, Nagaland, Meghalaya, Arunachal Pradesh, Sikkim, Tripura, and Andaman & Nicobar Islands) were also included under ICMR-NIRBI-RRL (Molecular HIV Laboratory).

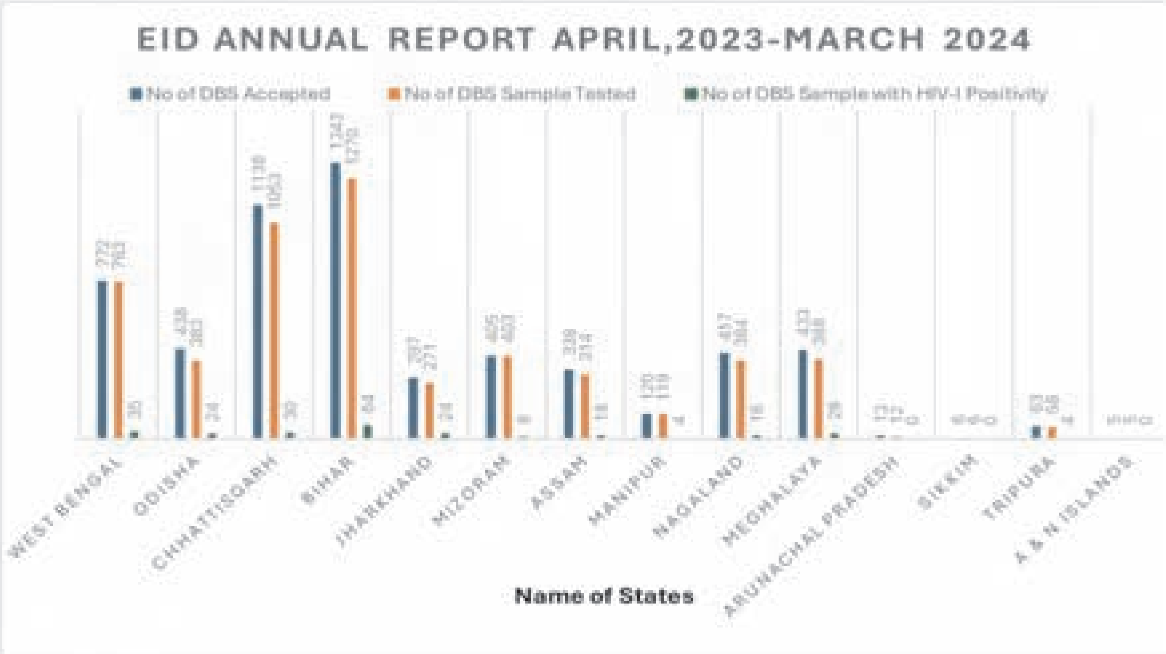
Presently, 1269 ICTCs are involved in collection of DBS samples in 14 states under NIRBI-RRL for DBS HIV-1 PCR. A National Testing Algorithm comprising of two sections according to the age group of the child (Algorithm A: for infants < 6 months and Algorithm B: for child 6-18 months) have been followed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

A total of **5812** DBS samples were received from April 2023 to March 2024 at ICMR-NIRBI - Regional Reference Laboratory (Molecular HIV Lab) and among them **5788** samples were accepted for testing, according to sample acceptance criteria. A total of **5429** DBS samples were tested for the period of 01.04.2023 to 31.03.2024 (The number of samples accepted and tested in a month may not tally due to previous pending samples) and their status is depicted below.

Table: Status of EID DBS Sample Accepted and Tested (with Positivity of HIV-1) at ICMR-NIRBI from the period April 2023 to March 2024

Name of States	No. of DBS Samples Accepted	No. of DBS Samples Tested	No. of HIV-1 DNA Detected DBS Samples
West Bengal	772	763	35
Odisha	438	383	24
Chhattisgarh	1138	1053	30
Bihar	1343	1270	64
Jharkhand	297	271	24
Mizoram	405	403	08
Assam	338	314	18
Manipur	120	119	04
Nagaland	417	384	16
Meghalaya	433	388	28
Arunachal Pradesh	13	12	00

Sikkim	06	06	00
Tripura	63	58	04
A & N Islands	05	05	00
TOTAL	**5788**	**5429**	**255**



NACO RI:

ICMR-NIRBI is the Regional Institute (RI) East for HIV Sentinel Surveillance. HIV Sentinel Surveillance (HSS) has been implemented among antenatal clinic attendees and prison inmates, and it is currently in progress at the national level for high-risk groups and bridge populations. ICMR-NIRBI serves as the lead institute for Integrated Biological and Behavioural Surveillance (IBBS) among High-risk group (HRG) populations, utilizing Respondent Driven Sampling (RDS). The institute is also spearheading two pilot activities: IBBS among Clients of Female Sex Workers (FSW) in West Bengal, Rajasthan, and Orissa, and Programmatic mapping and size estimation (p-MPSE) of Men who have sex with men (MSM) and Transgender (TG) individuals on virtual networks in the states of Chhattisgarh and Nagaland. Other activities under the Integrated and Enhanced Surveillance and Epidemiology (IESE) include mortality surveillance among People Living with HIV (PLHIV) to determine the causes of death through verbal autopsy , IBBS among PLHIV registered to ART centers and p-MPSE among Clients of FSW in Nagaland.

Phage typing of *V. cholerae* O1:

As a referral centre, the Vibrio Phage Reference laboratory of ICMR-National Institute of Cholera and Enteric Diseases is engaged in phage typing study of *V.cholerae* O1 biotype ElTor and *V.cholerae* O139 strains over a span of several decades with an aim to provide an invaluable service to the nation in the ever going battle against cholera.Numerous academic and research institutions, including medical colleges and hospitals, consistently submit samples for phage typing analysis reflecting the critical role that our laboratory plays in public health surveillance and epidemiological studies.

Over the last one year, we have received and characterized 103 strains of *V.cholerae* O1. Each strain was subjected to serological identification using polyvalent O1, followed by mono-specific Inaba and Ogawa antisera. The strains were characterized through both the established phage typing scheme of Basu and Mukherjee and a new phage typing scheme tailored for *V.cholerae* O1 biotype ElTor strains. Conventional phage typing scheme of Basu and Mukherjee discriminated the strains into two different types. Upon analyzing the phage typing results derived from this innovative methodology, we uncovered the presence of seven distinct phage types among the *V. cholerae* O1 biotype ElTor strains. Among these types, phage type 27 emerged as the predominant variant, accounting for an impressive 59.48% of the characterized strains, thereby illustrating its prevalence in the current epidemiological landscape. Following closely was phage type 26, which constituted 14.39% of the samples, while phage type 19 represented a smaller but significant proportion at 6.06%.

By maintaining a robust system for phage typing, the Vibrio Phage Reference laboratory contributes to the efforts of the scientific community to develop effective strategies for cholera prevention and control, thereby ultimately protecting public health and ensuring the safety of populations at risk.

FLAGSHIP PROGRAMMES - SWACHH BHARAT CAMPAIGN

The activities of ICMR-NIRBI under the Swachhta Action Plan during the period April 2023 to March 2024 included Swachhta Awareness Campaign among the school children and slum dwellers as well as observation of Swachhta Pakhwada as directed by the concerned ministry. A brief account of the activities is mentioned below.

Swachhta Programmes in the Communities:

ICMR-NIRBI organized several community-based programmes to promote Swachhta-related awareness and practices among the community members. The ICMR-NIRBI 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: Swachhta awareness campaigns in the communities

Date	Venue	Participants
June 30, 2023	Premises of Park Circus Balak Sangha, Kolkata-46	22 adults and 14 children of the locality
October 31, 2023	Roadside eateries near ICMR-NIRBI, beside Subhas Sarabor Park, KMC Ward No.33 Kolkata- 700 010	Shop owners and customers of three roadside eateries
March 14, 2024	Slum area in Kadapara, near EM Byepass	~20 mothers and 10 under-5 children

Glimpses of community-based activities:

Swachhta Programmes in the schools:

ICMR-NIRBI organized three school-based programmes to promote Swachhta-related awareness and practices among the school children and teachers. The ICMR-NIRBI team members discussed about water and food safety, sanitation and hygiene, especially to prevent various common illnesses among the children. They also distributed soap and handwash liquids in the participating schools.

Table: Swachhta awareness campaigns in the schools

Date	Venue	Participants
October 18, 2023	P. R. Adarsha Vidyalaya, Kol-85	~80 students of class V-X and two teachers
March 27, 2024	A.I.W.C Buniyadi Bidyapith Girls High School, Beliaghta, Kolkata	48 girl student of class nine and two teachers
March 28, 2024	Indrani Memorial Girls' High School, 19/3, Kadapara, Kolkata-700054	35 students of class V and the Head Mistress

Glimpses of school-based activities:

Special Swachhta Drives by ICMR-NIRBI:

Programmes under Swachhta Pakhwada (September 15 – October 02, 2023)

Theme: *Garbage Free India*

(A) Swachhta Awareness Campaign among Roadside Food Joints: A team of scientists and members of Swachh Bharat Committee of ICMR–NIRBI conducted a Swachhta Awareness Campaign on September 26, 2023 to create awareness and promote hygienic practices among the owners as well as customers of roadside food joints along the streets around ICMR-NIRBI. The team members also interacted with the passer byes regarding maintenance of personal hygiene, food and water safety, and environmental sanitation including garbage disposal.

(B) Swachhta Awareness Campaign in Slum Community: Dr. Debjit Chakraborty, Scientist D of ICMR-NIRBI delivered a popular lecture among the residents of an urban slum community to spread awareness about cleanliness, hygiene and their roles in disease prevention and health promotion. The lecture was followed by an interactive session where many of the residents participated.

(C) Cleaning Activity Within NIRBI-I Building Campus:
A voluntary cleaning activity was organised within the premises of NIRBI-I building on September 29, 2023. This activity was led by the Director, ICMR-NIRBI and was attended by the scientists and staff of the institute, who also pledged to keep their individual workspaces neat and clean throughout the year.

(D) Voluntary Cleanliness Drive (*Shramadaan*) in Selected Field Area:
The *Shramadaan* activity was carried out by ICMR-NIRBI in an urban slum area on September 29, 2023. The scientists and staff of the institute, led by the Director, ICMR-NIRBI took part in this voluntary cleanliness drive. This was followed by an interactive discussion with the residents in the area.

(E) Swachhta Pledge Taking Ceremony:
A Swachhta Pledge taking ceremony was organized by ICMR-NIRBI on September 29, 2023. The event was attended by all scientists, staff and students of ICMR-NIRBI who took the pledge in Hindi, English and Bengali.

Glimpses of Swachhta Hi Seva 2023 activities:

OUTBREAK INVESTIGATIONS

Acute Dirreohal Diseases outbreak in Rourkela, Sundargarh, Odisha

Ministry of Health and Family Welfare deployed a Central Multidisciplinary Team comprising of four expert members including a microbiologist from ICMR-NIRBI to Sundargarh, Odisha in response to an unusual diarrheal disease outbreak in Rourkela. The team assessed the situation and made recommendations for public health measures. A sudden increase in acute diarrheal disease cases was reported in Rourkela General Hospital and Ispat General Hospital, leading to surveillance, treatment, and water quality testing efforts. Nine deaths occurred, with one case testing positive for *Vibrio Cholerae*. Independent teams from medical colleges also conducted assessments, confirming Vibrio Cholerae in additional cases. The situation was actively monitored and managed to prevent further spread.

The Central Multidisciplinary team visited various treating facilities in Rourkela to assess the handling of Acute Diarrheal Disease (ADD) cases, including community perceptions and interventions. Data from October to December 2023 was analysed by our team to confirm the outbreak and standards followed during the emergency situation. Laboratory investigations were conducted at different facilities for testing stool and water samples. Samples were found to contain *Vibrio cholera*. Water and food quality tests were also performed to identify potential sources of contamination. The team recommended additional testing to understand antibiotic resistance patterns. Overall, the outbreak was linked to *V. cholerae*, and efforts were made to better understand and manage the situation through in-depth analysis and monitoring.Public health measures controlled the outbreak, with cases decreasing by late December. Recommendations included continued surveillance, improved sample transport, regular water quality monitoring, and analysis of communicable disease data for public health action.

Meeting With Commisioner of RMC By Central Team

Visit at WATCO By Central Team

Lab Visit By Central Team

TRAINING & EXTENSION

A. Important Meetings held at ICMR-NIRBI

51st Scientific Advisory Committee (SAC) Meeting of ICMR- NIRBI held on 19.02.2024. Following welcome address by Director, ICMR- NIRBI, SAC Chairperson of ICMR-NIRBI addressed the Scientists about the institutional expectation. Secretary DHR & DG, ICMR addressed the SAC members and ICMR-NIRBI scientists online and emphasized on the expansion of mandate towards Bacterial Diseases and Antimicrobial Resistance. ICMR representative also mentioned about high quality of research being carried out at ICMR-NIRBI. Following Director's overall presentation individual Scientists presented their intramural projects and SAC members provided useful comments for further improvement. The meeting ended with vote of thanks from Director, ICMR- NIRBI.

B. Visit of Scientists / Scientific Staff /Academicians

Lecture/ session Title	Date	Invited scientists/ Academicians
"Health communication essentials and social media insights of ICMR-NIRBI"	18th October, 2023	Mr. Abhishek Kumar Singh, ICMR Health Communication Intern,
The end is the beginning and the beginning is the end, a novel perspective on the regulation of gene expression	19th October 2023	Dr. Shiladitya Chattopadhyay, Assistant Professor, NIPER, Kolkata
Using zebrafish to understand the Vibrio cholerae environmental life cycle	25th January, 2024	Dr. Jeffrey H. Withey, Professor, Department of Biochemistry, Microbiology and Immunology, Wayne State University School of Medicine, Detroil, USA

C. Training/ Workshop/ Conferences held at ICMR-NIRBI

Webinar conducted by ICMR-NIRBI

Webinars delivered by Dr. Sriram Selvaraju, Scientist E, ICMR-National Institute for Research in Tuberculosis (NIRT), Chennai on **"Tuberculosis Epidemiology in India"** and delivered by Dr. Reena K. Samuel, Consultant Medical Microbiologist, National Tuberculosis Institute (NTI), Bengaluru on **"Molecular diagnostics in Tuberculosis"** respectively on **20th December, 2023**.

Webinar on the theme "*Controlling Viral Gastroenteritis: From Gut Microbiome to Vaccines*" on **30th January, 2024**. Dr. Vanessa Harris, Assistant Professor, Department of Global Health, Amsterdam UMC, University of Amsterdam (UvA), Netherlands delivered a talk on "**Controlling viral gastroenteritis Understanding transkingdom microbiome associations with rotavirus vaccine performance**" and Dr. Jelle Matthijnsens, Laboratory of Clinical and Epidemiological, Virology (Rega Institute), Rega – Herestraat, Leuven, Belgium delivered talk on "**Rotaviruses in Belgium: Epidemiology after vaccination and during the COVID pandemic, co-infections and vaccine revertants**" respectively.

Webinar on the theme "*Exploring the Spectrum: Neonatal Sepsis in Focus*" on 29th February, 2024. Prof. Dr. Arun Kr. Singh, Head, Department of Neonatology, AIIMS, Jodhpur & National Advisor, Rashtriya Bal Swasthya Karyakram, Ministry of Health & Family Welfare delivered a talk on "**Insight into Sepsis in newborn: where we are and where are we going**".

A 'Clinical Research Essential' workshop on "National Workshop on Good Clinical Practice & Regulations in Clinical Research-2023 (NWGCP & RCH 2023)" was organized by ICMR-NIRBI on 5th April, 2023 at ICMR-NIRBI, Kolkata. The workshop was attended by clinical research professionals and the Ethics committee members of multiple Institutes from all over India and made the event a grand success.

Anne-Laure Page, Scientist from WHO Prequalification – IVD performance evaluation, WHO, Geneva visited ICMR-NIRBI on 15-16 May 2023 to oversee the current WHO Prequalification activities. The visit started with general introductions and presentations on WHO PQ performance evaluations followed by the visit to the clinical bacteriology laboratory to review the procedures for the evaluation of the in vitro cholera rapid diagnostic tests. On the next day, she visited the HIV laboratory to check the updates on the HIV panel and discuss the protocol for HIV RDT evaluation.

Dr. A.K. Puri, Deputy Director General (NACO-CST), Dr. Vibhawari Deshmukh, National Consultant (NACO-BSD), Vinita Verma, National Consultant (NACO-SI) along with officials from West Bengal State AIDS Prevention & Control Society visited ICMR-NIRBI on 24th May 2023 to oversee the activities of NACO-HIV laboratories including ICTC, NRL, Viral Load and EID program. The visit started with an opening meeting with the Director, ICMR-NIRBI followed by interaction with laboratory personnel and verification of laboratory documents. Ongoing issues with probable solutions were discussed in detail. NACO officials have expressed their keen interest to extend the scope of work with ICMR-NIRBI.

Honorable Union Minister Sri Mansukh Mandaviya ji, Minister of Health & Family Welfare & Chemicals and Fertilizers, Govt. of India, visited ICMR-NIRBI on 29th May 2023. He held a strategic review meeting with the Director and other Scientist of ICMR-NIRBI on ongoing research initiatives. In the beginning he inaugurated virtually the Next Generation Sequencing facility at National Repository for Antimicrobial Resistant Bacteria, a facility developed at ICMR-NIRBI. Dr. Shanta Dutta, the Director, ICMR-NIRBI welcomed and felicitated Sri Mansukh Mandaviya ji. She also presented before him the significant research activities and milestones of ICMR-NIRBI in combating diarrhoeal diseases including Cholera, Antimicrobial Resistance, COVID-19, Product Development and Vaccine Trials. Sri Mansukh Mandaviya ji appreciated the endeavour and emphasised on the huge translational value of the work towards strengthening of public health systems. He stressed upon the international exposure of scientists, commercialization of patented products, country centric and integrative research with the industry. He encouraged the scientists to take up more collaborative and solution driven research which will benefit the science, system and the society at large.

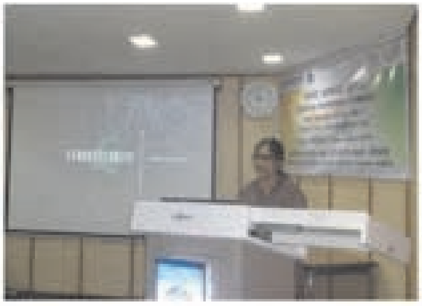
ICMR- NIRBI observed the World Environment Day 2023 on 5th June. On this occasion a trilingual pledge (English / Hindi/ Bengali) on importance of environment friendly habits was taken by the staff and students under the leadership of Dr. Shanta Dutta, Director, T.S. Gopakumar, Administrative Officer and Dr. Alok Chakraborty, Scientist -E respectively.

In this occasion, following opening address by Dr. Shanta Dutta, Director, ICMR-NIRBI, Professor (Retd) Sugata Hazra, School of Oceanographic Studies, Jadavpur University delivered a talk on "Sundarbans, Climate Crisis and emerging diseases" where he efficiently and interactively presented multiple facets of climate crisis in sundarban and need for integration towards mitigation of climate crisis impacting health. All the scientific, administrative, technical & project staff, students participated in the programme and made it successful.

On the occasion of World Blood Donor Day (14th June 2023), ICMR- NIRBI organized a blood donation Camp. Dr. D.K. Panda, Director, RBTC, NRS Medical College, Kolkata, graced the occasion along with his team. Under the leadership of Dr. Shanta Dutta, Director, ICMR-NIRBI, a trilingual pledge (English, Hindi, Bengali) on blood donation was taken by all present. Both Dr. Dutta and Dr. Panda stressed on the importance of voluntary blood donation and its impact on the society. Scientists, staff and students participated wholeheartedly in this voluntary campaign under medical as well as dietary supervision and donated blood to save life.

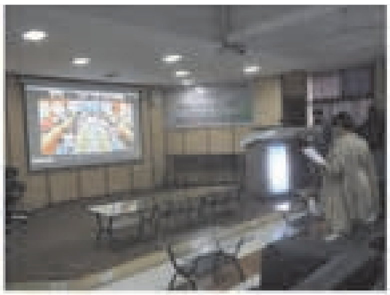
The one day familiarization visit cum training program of trainee doctors from Command hospital, Kolkata to ICMR-NIRBI on 6th Oct, 2023. Lt. Col (Dr.) Vandana Kumari and her team of trainee doctors visited different divisional labs of ICMR NIRBI. Introduction and orientation of different divisions has been provided by divisional heads and other senior scientists. The program ended with a discussion between all the participants and the scientists. We look forward to welcome their trainee and staff at ICMR-NIRBI again.

ICMR-NIRBI organized the Vigilance Awareness Campaign 2023 on 16.10.2023. Dr. Shanta Dutta, Director & Scientist G delivered the welcome address. On this occasion, Ms. Sharmistha Chatterjee, an IT and Information Security Professional, delivered a lecture on "Cyber Security - Staying Safe Online" describing the nuances of cyber threats and how to remain safe from it.
This was followed by a warm felicitation of Dr. Phalguni Dutta, former Deputy Director- (Senior Grade), ICMR-NIRBI, by the Director, and present staff of ICMR-NIRBI, in recognition to his relentless service and uninterrupted association with this Institute for 50 years in various capacities. The Director expressed her gratitude towards him for his contributions towards the scientific and administrative activities of the Institute. He was felicitated with flower bouquet, a citation and token mementos. The program ended with a Vote of Thanks from Dr. Amit Pal, Scientist-G & and Vigilance Officer, ICMR-NIRBI.

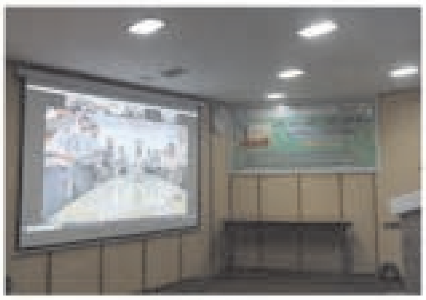





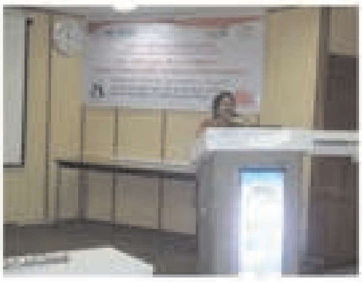
On the occasion of #VigilanceAwareness Week being observed from October 30-November 5, 2023, Scientists & staff of ICMR – NIRBI took the Integrity Pledge led by Dr. Rajiv Bahl, Secretary, DHR, MoHFW & DG, ICMR, reaffirming our commitment to a Corruption free Society.


On the birth anniversary of Sardar Vallabhbhai Patel, Scientists and staff of ICMR-NIRBI took the Rashtriya Ekta Diwas pledge to uphold the unity and integrity of our nation. Let's work together to build a stronger, more united India. On this occasion, Scientists and staff of ICMR-NIECD wholeheartedly participated in the "Run for Unity" from ICMR-NIRBI JICA building to ICMR-NIRBI administrative building via Beliaghata Police Station-Subas Sarobar Park Road, exemplifying our commitment to a united India on this



Internal Complaints Committee (ICC) of ICMR-NIRBI organized an Awareness Campaign for sensitization of the employees of the Institute on Prevention of Sexual Harassment (POSH) Act 2013 on 7th November 2023. The theme of the Awareness campaign was Women Safety, Security and Empowerment. Ms. Suranjana Basu Das Joint Secretary, Lake Gardens Women and Child Development Center was the invited speaker. The programme started with felicitation followed by a welcome address by the Director ICMR-NIRBI. The talk of Ms. Suranjana Basu Das included guidelines regarding formation, constitution of the ICC, how to lodge complaint, timelines to complete the impartial enquiry and other nuances of the Act. Her talk was followed by question and answer session. Scientists, Staff and Research Fellows attended the program and made it successful. The programme ended with a vote of thanks by Chairperson, ICC.

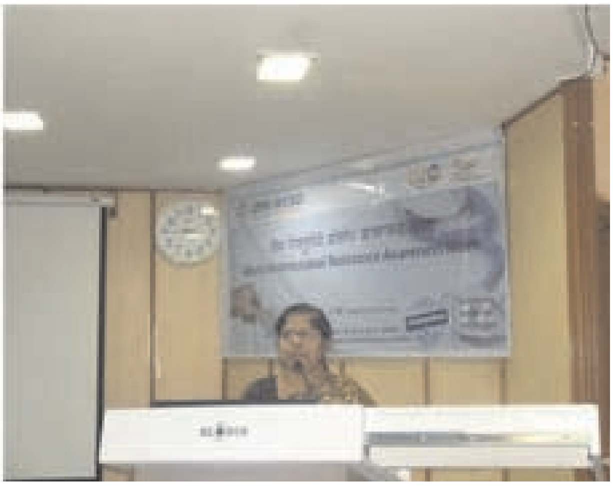

As part of creating awareness among general public towards corruption ICMR-NIRBI observed Vigilance Awareness Week through arrangement of essay writing, slogan writing and quiz competition on the theme "Say no to corruption: Commit to the Nation" with participation of girls from a local school on 09.11.2023. The participants enthusiastically took part in the competition. The event was followed by distribution of prizes and a certificate by the Dr. Shanta Dutta , Director, ICMR-NIRBI. She also addressed the audience about their role in preventing corruption in day to day life towards contributing to corruption free India. The event ended with a vote of thanks by Dr. Amit Pal, Scientist G, Chairperson, Vigilance Awareness Week Committee, ICMR-NIRBI.



On the occasion of World Antimicrobial Resistance Awareness Week (18-24 November 2023), Scientists of ICMR-NIRBI conducted an awareness program at Government Nursing College, ID and BG hospital campus, on 22nd November, 2023 on the topic: 'The role of nurses in combating AMR'. It was an interactive session where students and faculty members took active part in the discussions and shared their experiences. IEC materials prepared by staff of ICMR-NIRBI were distributed among the nursing students.



On the occasion of World Antimicrobial Resistance Awareness week 2023, Scientists at ICMR-NIRBI conducted an awareness program among community members at a subcentre under Jirangachha Rural Hospital in South 24 Pargana District. The community dialogue was attended by mothers and ASHA workers. The closing ceremony of World Antimicrobial Resistance Awareness Week was organized at ICMR - NIRBI on 23/11/2023. Dr. Shanta Dutta, Director, ICMR NIRBI emphasized the need for all sector awareness in preventing AMR. Prof (Dr) Nabanita Bhattacharya, Principal, ID & BG Hospital attended the program and expressed her thought on the AMR scenario in India. Prof (Dr.) Soma Saha Sarkar from ID & BG Hospital delivered an interactive lecture on "AMR - a Silent Pandemic". Prizes and Certificate were distributed to the students & staff who participated on AMR week poster competition. Posters and IEC materials were displayed and disseminated.



ICMR- NIRBI observed Constitution Day (26th November) on 24.11. 2023 through reading of the Preamble of the Constitution of India. Preamble was read in Hindi and English by all scientific, technical and ministerial staff of ICMR- NIRBI simultaneously with ICMR Headquarter led by Dr. Rajiv Bahl, Director General, ICMR.

The Third & Final Technical Resource Group meeting of UNDP funded Project titled “Development of a Framework to identify Research Priorities for Mitigating the impact of Climate Change on HIV Response in India” was organized at ICMR- NIRBI on 24th November 2023. Dr. Shanta Dutta, Director, ICMR NIRBI in her welcome address expressed the progress of this study and heartily welcomed all the dignitaries from diverse disciplines as TRG members. Dr. Chiranjeev Bhattacharya, Program Officer, UNDP graced the occasion and said about the conceptual framework and the draft report developed from the meeting. Following a brief presentation by Dr. Debjit Chakraborty, Scientist – E the open discussion and brainstorming was done by the TRG members on the cross-cutting issues and future research roadmaps. The meeting ended with concluding remarks from Dr. Agniva Majumdar, Scientist-C and vote of thanks from Ms. Monica Sharma, Scientist- B.


An awareness campaign by ICMR- NIRBI on basics of infection prevention among School children of New National High School, Kankurgachhi , Kolkata was held on 29th November 2023. Students of class 8 -10 participated in this program. The students were informed about preventive ways to reduce common infections. Six steps of hand washing were also demonstrated to them. They were also told about the reasons of not buying medicine over the counter. IEC materials prepared by staff of ICMR- NIRBI were distributed.



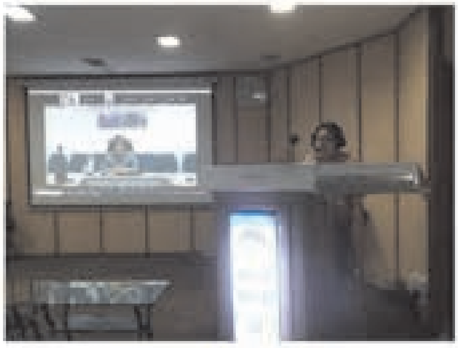
ICMR NIRBI observed World AIDS Day on 1st December, 2023. The theme for this year is “Let Communities Lead”. Dr Shanta Dutta, Director ICMR-NIRBI in her welcome address emphasized on the significance of this day. Then a panel discussion by members of Network organization; a talk on journey as a transgender by Dr. Santosh Giri and Ree Sen from Kolkata Rista and cultural performance by renowned Arindam Sarkar and team from Nataraj Dance Group were staged. A video on the perspective of HIV among common people and celebrities was displayed. The program ended with a “Shruti Natok” (audio drama) by staff of ICMR- NIRBI.



ICMR-NIRBI organized a sensitization programme on the occasion of "Sexual Harassment at Workplace Prevention Week" during 4th to 9th December, 2023. Ms. Soma Roy Karmakar, Research Consultant, Equidiversity Foundation, Kolkata delivered an interactive lecture to make aware about nuances and scopes of PoSH Act. Her talk was followed by brainstorming interaction with the audience. Scientists, technical, ministerial & project staff, research fellows and students attended the program and made it successful.



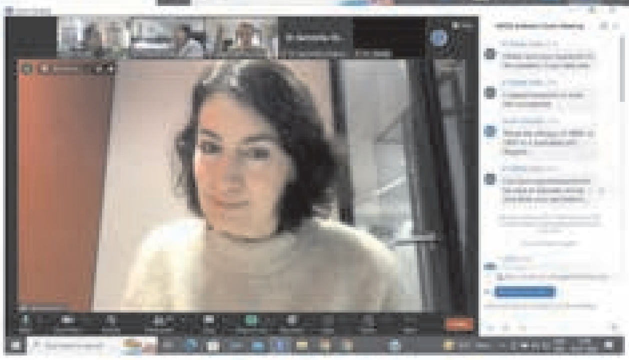
ICMR-NIRBI organized a webinar on "Epidemiology of Tuberculosis in India" and "Molecular diagnostics in Tuberculosis" on 20th December 2023. Dr. Sriram Selvaraju, Scientist E, ICMR-NIRT, Chennai and Dr. Reena K. Samuel, Consultant Microbiologist, NTI, Bengaluru were the speakers. Scientists/Medical professionals/students across various institutes participated in this webinar and made it a grand success.

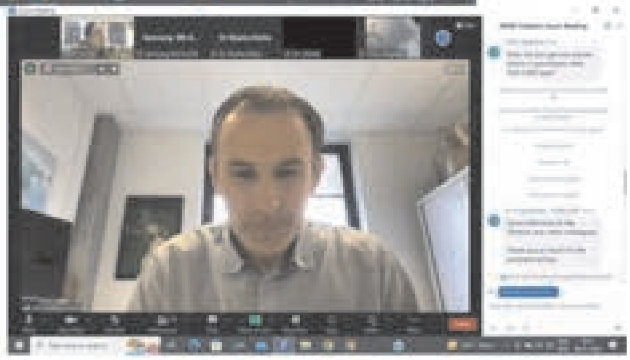



Dr. Jeffrey H. Withey, Professor, Department of Biochemistry, Microbiology and Immunology, Wayne State University School of Medicine, Detroil, USA delivered a talk on "Using zebrafish to understand the Vibrio cholerae environmental life cycle" on 25th January, 2024 at ICMR- NIRBI. His talk was followed by brainstorming interaction with the audience. Scientists, Research Fellows and students attended the seminar and made it successful.

Celebration of 75th Republic Day (2024) of India at ICMR-NIRBI, Kolkata. Prof. N.K. Ganguly, Former Director General, ICMR was present with his wife in this event. Director, Staff and their family members participated in flag hoisting ceremony at 11.00 a.m. at the premises of NIRBI-1 building. Following Flag hoisting, inspirational speeches were delivered by Prof. N.K. Ganguly and Dr. Shanta Dutta, Director, ICMR-NIRBI. A few other staff also expressed their opinions on the importance of this Day. A cultural program on patriotism was organised by the staff. The program ended with National Anthem sung by the NIRBI-staff.

ICMR-NIRBI organized a webinar on the theme "Controlling Viral Gastroenteritis: From Gut Microbiome to Vaccines" on 30th January, 2024. Dr. Vanessa Harris, Assistant Professor, Department of Global Health, Amsterdam UMC, University of Amsterdam (UvA), Netherlands delivered a talk on "Controlling viral gastroenteritis Understanding transkingdom microbiome associations with rotavirus vaccine performance" and Dr. Jelle Matthijnsens, Laboratory of Clinical and Epidemiological, Virology (Rega Institute), Rega – Herestraat, Leuven, Belgium presented on "Rotaviruses in Belgium: Epidemiology after vaccination and during the COVID pandemic, co-infections and vaccine revertants". Scientists/Medical professionals/students across various institutes participated in this webinar and made it a grand success.

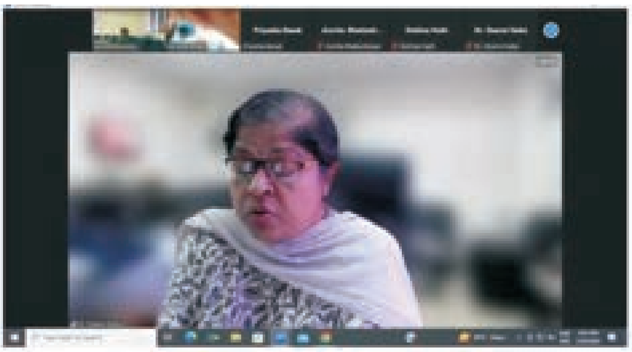


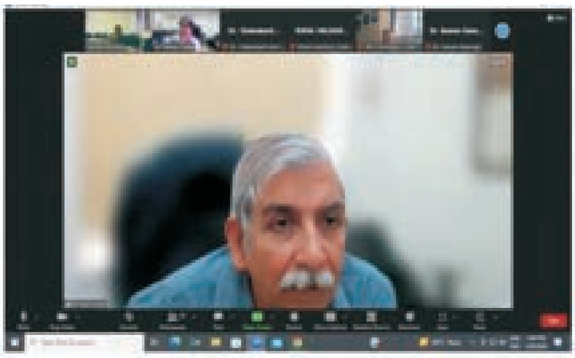


In connection with Integrated Biological & Behavioural Surveillance (IBBS) among Male Clients of Female Sex Workers, the Field Level Training was conducted from 6th -8th February 2024 by Regional Institute (East) for HIV Surveillance & Epidemiology at ICMR-NIRBI. Dr Shanta Dutta, Director ICMR-NIRBI in her welcome address emphasized the importance of this ltraining. Regional Institute Team members from Rajasthan, Odisha & West Bengal participated in the training and made the program a grand success.

National Science Day 2024 was observed at ICMR- NIRBI on 28th February 2024. Dr. Arghya Chattopadhyay, Assistant Professor, Department of Medicine, North Bengal Medical College, Darjeeling, graced the occasion as Chief Guest and delivered a popular lecture on the topic "Immunology/Rheumatology". Following the lecture there was interactive discussion on the topic with the audience. All Scientists, technical, administrative, project staff and students participated and made the event successful.

ICMR-NIRBI organized a webinar on the theme "Exploring the Spectrum: Neonatal Sepsis in Focus" on 29th February, 2024. Prof. Dr. Arun Kr. Singh, Head, Department of Neonatology, AIIMS, Jodhpur & National Advisor, Rashtriya Bal Swasthya Karyakram, Ministry of Health & Family Welfare delivered a talk on "Insight into Sepsis in newborn: where we are and where are we going". Staff, students, Scientists participated in this webinar and made it a grand success.





The 62nd Foundation Day of ICMR-NIRBI was celebrated on 1st March 2024. Following inaugural song by staff & students, Dr. Shanta Dutta, Director, ICMR-NIRBI, in her welcome address mentioned the glorious journey and evolution of this institute over the years. Following lighting of ceremonial lamp, Prof.(Dr.) Uday Bandyopadhyay, Director, Bose Institute, Kolkata, Guest of Honor and Prof. (Dr.) Dipankar Maji, Joint Director, Public Health, Department of Health and Welfare, Government of West Bengal as Special guest addressed the august audience.

Prof. (Dr.) Uday Bandyopadhyay delivered the ICMR-NIRBI Oration on the topic "Impact of acute mental stress on gastropathy/gastric ulcer: Gut brain axis – Mitochondria relation in stomach." Employees completing 25 years' service at the ICMR were felicitated. The program was ended with National Anthem following cultural program by staff and students of ICMR-NIRBI.

ICMR-NIRBI, observed the International Women's Day on March 8, 2024. The theme of women's day of this year is "Invest in women: Accelerate Progress". Dr. Shanta Dutta, Director, ICMR-NIRBI inaugurated the program with her inspiring welcome address where she encouraged on gender sensitive inclusion. Dr. Sushmita Roychowdhury, Director Pulmonology, Fortis Hospital, Kolkata, Dr. Sabnam Ara Begum, Associate Professor, Pharmacology, R.G. Kar Medical College & Hospital and Ms. Madhura Mitra, Executive Director, PWC, Kolkata enlightened on the different perspectives they bring to the profession including their journeys in the career, challenges and privileges. An interactive session on "Climate Change, Pollution and Respiratory Illness" followed where issues like rising climate alteration, increasing pollutant burden and its consequence on health & productivity, deficient preparedness of public health sectors were discussed. Dr. Dutta encouraged all the women staff and students of the institutes and felicitated the speakers. Participation of Scientists, administrative, technical, project staff and students made the event successful.

A training on Early Infant Diagnosis Testing and Laboratory Management was conducted by the NACO Regional Reference Laboratory, Early Infant Diagnosis (EID), ICMR-NIRBI from 19th to 20th March 2024. One Technical Officer and one Laboratory Technician from Naga Hospital, Kohima, Nagaland attended the training. The objective was to facilitate the setup of a new EID lab at Naga Hospital, Kohima, to handle infant HIV sample testing from six states in North East India. The training covered various aspects of Early Infant HIV diagnosis testing and quality management of the laboratory.

Project Title	:	Establishment of a network of Laboratories for managing epidemics and Natural Calamities (VRDL) (Extramural)
Name of PI	:	Dr. Shanta Dutta
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Mamta Chawla Sarkar, Dr. Provash Ch. Sadhukhan, Dr. Agniva Majumdar
Funding Agency	:	DHR/ICMR
Period	:	2016 onwards

Project Title	:	SARI/ILI Surveillance - Pan India Epidemiological, Virological and Genomic Surveillance for Human Influenza and COVID-19 through DHR-ICMR VRDL Network
Name of PI	:	Dr. Shanta Dutta
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Agniva Majumdar, Dr. Ananya Chatterjee, Dr. Sandip Samanta (MSVP, Dr. B.C. Roy Hospital)
Funding Agency	:	DHR/ICMR
Period	:	2021 onwards

Project Title	:	Respiratory Adenovirus Characterization
Name of PI	:	Dr. Agniva Majumdar
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Shanta Dutta, Dr. Mamta Chawla Sarkar
Funding Agency	:	DHR/ICMR
Period	:	2023

Project Title	:	Operationalization of the Model Rural Health Research Unit (MRHRU), Darjeeling, West Bengal
Name of PI	:	Dr. Shanta Dutta (Director of Nodal Institute)
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Sandip Mukhopadhyay (Nodal Person)
Funding Agency	:	DHR, GOI
Period	:	2023 onwards

Project Title	:	AES Project under PM-ABHIM Scheme - Development of a sustainable network of laboratories in India for identification, monitoring and research on viruses causing acute encephalitis syndrome and other novel pathogens through capacity building in advanced biomedical technologies
Name of PI	:	Dr. Shanta Dutta (PI & Coordinator)
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Alok Kr. Deb, Dr. Asish Kr. Mukhopadhyay, Dr. Mamta Chawla Sarkar, Dr. Falguni Debnath, Dr. Surajit Basak and Dr. Agniva Majumdar
Funding Agency	:	ICMR
Period	:	10th July 2023 to July 2025

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, Director
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Sandipan Ganguly
Funding Agency	:	ICMR
Period	:	2019 – 2023 (Oct.)

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
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Alok Kr. Deb, Dr. Asish Kr. Mukhopadhyay, Dr. Suman Kanungo, Dr. Debjit Chakraborty
Funding Agency	:	ICMR, New Delhi
Period	:	2019-2023

Project Title	:	Centre for Advanced Research on Product Development Centre at NIRBI Kolkata
Name of PI	:	Dr. Shanta Dutta
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Sushmita Bhattacharya, Dr. Mamta Chawla Sarkar, Dr. Hemanta Koley, Dr. Sandipan Ganguly
Funding Agency	:	ICMR, New Delhi
Period	:	2019-2024

Project Title	:	Estimation of *Vibrio Cholera* O1 infection in India: a step towards identification of cholera hotspots
Name of PI	:	Dr. Shanta Dutta
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Ranjan Kr. Nandy, Dr. Suman Kanungo, Dr. Debjit Chakraborty
Funding Agency	:	ICMR, New Delhi
Period	:	2023

Project Title	:	Determining cause of death profiles among vulnerable communities to improve health interventions: pilot test of a practical verbal autopsy tool
Name of PI	:	Dr. Suman Kanungo
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Shanta Dutta, Dr. Melissa Glenda Lewis, Dr. Shubarna Chakraborty
Funding Agency	:	CRED-ASED and University of Louvain, Brussels
Period	:	2023

Project Title	:	A Phase II/III, Multicenter, Double-Blind, Randomized, Active Controlled Study to evaluate Safety and Immunogenicity of SII

		Inactivated Salk Polio Vaccine (Adsorbed) in comparison with SII (Serum Institute of India) Licensed Inactivated Poliovirus Vaccine (IPV)
Name of PI	:	Dr. Shanta Dutta
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Suman Kanungo, Dr. Agniva Majumdar
Funding Agency	:	Serum Institute
Period	:	2023
Project Title	:	National Repository of Antimicrobial Resistant Bacterial (NRAMRB): a facility under the "AMR Hub" for addressing AMR research across India
Name of PI	:	Dr. Shanta Dutta
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Ranjan Kr. Nandy, Dr. Asish Kr. Mukhopadhyay, Dr. Sulagna Basu, Dr. Debjit Chakrabarti, Dr. Agniva Majumdar, Dr. Surajit Basak
Funding Agency	:	ICMR, New Delhi
Period	:	August 2021- August 2024
Project Title	:	Development of a Framework to identify Research priorities for mitigating the impact of Climate Change on HIV Response in India.
Name of PI	:	Dr. Shanta Dutta
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Alok Kr. Deb, Dr. Debjit Chakrabarti, Dr. Agniva Majumdar, Ms. Monica Sharma
Funding Agency	:	UNDP
Period	:	2023-2024
Project Title	:	NACO Regional Institute for HIV Surveillance and Epidemiology Projects • HIV Sentinel Surveillance (HSS) among ANC, Prison and High-Risk Group (HRG) • Integrated Biological and Behavioral Surveillance (IBBS) among HRG population • Integrated Biological and Behavioral Surveillance (IBBS) among People Living with HIV (PLHIV) • Integrated Biological and Behavioral Surveillance (IBBS) among male clients of Female Sex Workers (CFSW) • Mortality Surveillance for HIV in West Bengal
Name of PI	:	Dr. S hanta Dutta
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	CoI: Dr. Alok Kr. Deb, Dr. Debjit Chakrabarti, Dr. Agniva Majumdar
Funding Agency	:	NACO

Period	:	2023-2024

Project Title	:	Emerging antimicrobial resistance in enteric pathogens with special reference to Shigella species
Name of PI	:	Dr. Shanta Dutta
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	NA
Funding Agency	:	NIID, Japan
Period	:	2019-2024

Project Title	:	Development of new medicine for diarrhea derived from traditional Indian folk medicine
Name of PI	:	Dr. Shanta Dutta
Names of CoI/CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Sushmita Bhattacharya
Funding Agency	:	AMED, Japan through Okayama University, Japan
Period	:	2020-2025

Project Title	:	Exploring antimicrobial therapeutics against Multidrug Resistant enteric bacteria (MDR) causing sepsis from traditional plants of North East India: Addressing the problem of antimicrobial resistance
Name of PI	:	Dr. Shanta Dutta
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Collaborative project with IBSD Imphal Dr. Sushmita Bhattacharya, Dr. Sulagna Basu, ICMR-NIRBI
Funding Agency	:	DBT
Period	:	2022-2024

Project Title	:	National Surveillance system for enteric fever in India
Name of PI	:	Dr. Shanta Dutta
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Debjit Chakrabarti
Funding Agency	:	CMC, Vellore
Period	:	2021-2023

Project Title	:	A novel therapeutic approach to kill cancer cells by microbial protease mediated proteasomal degradation of microtubule
Name of PI	:	Dr Amit Pal
Funding Agency	:	ICMR
Period	:	2021-2024

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)
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Sulagna Basu (ICMR-NIRBI) Dr. Pradip Bhowmik, Dr. Sanjib Kr. Debbarma, Dr. Debasish Barman, AGMC & GBPH Dr. Harpreet Kaur, ICMR Headquarters, New Delhi
Funding Agency	:	ICMR
Period	:	2019—2023 Concluded

Project Title	:	Characterisation of CRISPR-Cas system in drug-resistant gram-negative bacteria and its application in preventing horizontal gene transfer in bacteria.
Name of PI	:	Dr. Sulagna Basu, ICMR-NIRBI
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Dipanjan Ghosh, NIPER, Kolkata
Funding Agency	:	ICMR
Period	:	2023-2026 Ongoing

Project Title	:	Diagnostics for Hypervirulent *Klebsiella pneumoniae* causing sepsis targeting Resistance and Virulence determinants ($DH_{Kp}RUV$)
Name of PI	:	Dr. Sulagna Basu, ICMR-NIRBI
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Saugata Hazra, Dr. Devesh Bhimsaria (IIT-Roorkee), Dr. Falguni Debnath, Dr. Debjit Chakraborty & Dr. Sandip Mukhopadhyay (ICMR-NIRBI), Dr. Bijan Saha & Dr. Sougata Chowdhury (IPGMER & SSKM Hospital), Dr. Sanjit Kumar Patra, Dr. Swarupananda Maiti & Dr. Sudipta Pal (BSMCH), Dr. Kalpana Datta, Dr. Dinesh Munia & Dr. Anita Nandi, Dr. Debasis Ghosh (Calcutta Medical college and Hospital), Prof. Dr. Sugata Dasgupta (R.G Kar Medical College and Hospital)
Funding Agency	:	ICMR
Period	:	2024-2027 Ongoing

Project Title	:	Mapping the impact of birth mode on maternal and infant intestinal microbiome including virome and resistome development of allergic disorders and antimicrobial resistance.
Name of PI	:	Dr. Mallika Lavania, ICMR-NIV, Dr. Sulagna Basu, ICMR-NIRBI
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Rajlakshmi Viswanathan, Dr. L. Alagarasu, Dr. Sarah Cherian, ICMR-NIV; Dr. Sandip Mukhopadhyay, ICMR-NIRBI
Funding Agency	:	ICMR
Period	:	2023-2026 Ongoing

Project Title	:	Development of a vaccine against *Helicobacter pylori* based on immunogen formulatedfrom circulating prevalent strains
Name of PI	:	Dr. Hemanta Koley
Names of CoI /CoPI/collaborators with name of collaborating	:	Dr. Asish Kumar Mukhopadhyay

institute(s)		
Funding Agency	:	ICMR
Period	:	2023-2024

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
Funding Agency	:	ICMR
Period	:	2021-2024

Project Title	:	Differential pathogenesis of Giardia: Genomic variations of local isolates.
Name of PI	:	Dr. Sandipan Ganguly, Scientist F
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	
Funding Agency	:	National Institute of Infectious Diseases, Japan.
Period	:	2017-2024

Project Title	:	State wise prevalence mapping of soil transmitted helminthes in Indian children to support health impact evaluation. A ministry of health and family welfare, Govt. of India initiative
Name of PI	:	Dr. Sandipan Ganguly, Scientist F
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	
Funding Agency	:	Funded by WHO and DTWi
Period	:	2015-2023

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
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	
Funding Agency	:	ICMR
Period	:	2017-2023

Project Title	:	Characterization of the Pathogenic Factors of Local Isolates of *Giardia lamblia*.
Name of PI	:	Dr. Sandipan Ganguly, Scientist F
Names of CoI /CoPI/	:	

collaborators with name of collaborating institute(s)		
Funding Agency	:	Funded by ICMR
Period	:	2017- 2024

Project Title	:	Identification of novel Anti-Parasitic Compound from Natural Medicinal source and their effect on *Giardia lamblia.* Funded by CSIR.
Name of PI	:	Dr. Sandipan Ganguly
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	
Funding Agency	:	Funded by CSIR, New Delhi
Period (20-- to 20--)	:	2018-2024

Project Title	:	Identification of rotavirus induced dysregulated lncRNAs: An insight into the role of lncRNAs in regulating Rv infection
Name of PI	:	Mamta Chawla Sarkar. Sc F, ICMR- NIRBI
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Moumita Bhaumik. Sc C, ICMR-NIRBI
Funding Agency	:	DST SERB-Power
Period (2022 to 2025)	:	Ongoing

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 NIRBI
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Moumita Dutta , ICMR-NIRBI
Funding Agency	:	ICMR
Period (2020 to 2023)	:	Concluded

Project Title	:	Studies on Vascular Endothelial Dysfunction molecules in dengue virus infection: In search of an early potential marker for DHF/DSS.
Name of PI	:	Dr. Provash Chandra Sadhukhan
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr. Shanta Dutta Dr. Sandeep Samanta
Funding Agency	:	ICMR Extramural
Period (20-- to 20--)	:	2020-2023

Project Title	:	Pan-India antigenic characterization of dengue viruses: Early warning signal for a potential pandemic.
Name of PI	:	Dr. Provash Chandra Sadhukhan
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr.Siraj Ahmed Khan, ICMR- RMRC, Dibrugarh Dr. Rituraj Niranjan, ICMR- NIRTH, Bhopal Dr. Anu Kumar, NIV Kerala Unit Dr. S.S. Mohanty, ICMR-NIIRNCD, Jodhpur Dr. Rajeev Singh, ICMR-Regional Medical Research Centre Gorakhpur Dr. Gajanan Sapkal, NIV, Pune Dr. Luke Hanna, NIRT Chennai Dr. Thirumala, NARF, Hyderabad Dr. Harpreet Singh, Division of Bio-Medical Informatics, ICMR HQ
Funding Agency	:	ICMR Extramural
Period (20-- to 20--)	:	2024 - 2027
Project Title	:	Pan-India antigenic characterization of dengue viruses: Early warning signal for a potential pandemic.
Name of PI	:	Dr. Provash Chandra Sadhukhan
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	:	Dr.Siraj Ahmed Khan, ICMR- RMRC, Dibrugarh Dr. Rituraj Niranjan, ICMR- NIRTH, Bhopal Dr. Anu Kumar, NIV Kerala Unit Dr. S.S. Mohanty, ICMR-NIIRNCD, Jodhpur Dr. Rajeev Singh, ICMR-Regional Medical Research CentrGorakhpur Dr. Gajanan Sapkal, NIV, Pune Dr. Luke Hanna, NIRT Chennai Dr. Thirumala, NARF, Hyderabad Dr. Harpreet Singh, Division of Bio-Medical Informatics, ICMR HQ
Funding Agency	:	ICMR Extramural
Project Title		Anti-microbial Resistance Research & Evidence Synthesis for Stewardship Implementation And Surveillance Program Development Framework Assessment (amres)
Name of PI		Dr. Falguni Debnath
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)		Dr. Debjit Chakraborty, Dr. Sulagna Basu, ICMR-NIRBI
Funding Agency		ICMR
Period (20-- to 20--)		2022-2025 Ongoing
Project Title	:	Surveillance of foodborne disease pathogens from North-East India
Name of PI	:	
Names of CoI /CoPI/ collaborators with name of collaborating	:	Dr. Nilanjan Chakraborty (Scientist- F), ICMR-NIRBI Virus Research Laboratory

institute(s)		
Funding Agency	:	ICMR Task Force Project
Period (20-- to 20--)	:	2021 to 2025

Project Title	:	Isolation and characterization Diarrhea associated bacteriophages and their use in Phage Therapy
Name of PI	:	Dr. Alok Kumar Chakrabarti
Names of CoI /CoPI / collaborators with name of collaborating institute(s)	:	Dr. Hemanta Koley and Dr Shanta Dutta
Funding Agency	:	ICMR
Period	:	2021-2024

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-NIRBI
Funding Agency	ICMR
Period	2022-2024.

Project Title	Efficacy of newly isolated lytic Shigella phage cocktails on *Shigella flexneri* planktonic cultures and biofilms.
Name of PI	Dr. Surajit Basak, ICMR-NIRBI
Period	2023-2026.

Project Title	Development of next generation drug library and information resource of the alternative therapeutic use of FDA approved drugs by Kernel-based machine learning integration of molecular structure, molecular activity and phenotypic data
Name of PI	Dr. Surajit Basak, ICMR-NIRBI
Funding Agency	DHR
Period	2023-2026

Project Title	Comparative assessment of immune responses following covaxin, covishield, sputnik-V and development of a novel vaccine candidate using doggybone/(MIDGE) DNA encoding spike protein for employing alongside current vaccines in heterologous prime-boost approach in mice (DBDNA Vaccine)
Name of PI	Dr. Maumita Bhaumik
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	Dr. Aloke Chakrabarti (ICMR-NIRBI), Dr. Santanabha Das (Diamond Harbour Women's University)
Funding Agency	ICMR
Period	2022-2025

Project Title	Sphingolipid as mediator in the interface of microbiome and host: implication in gut pathology
Name of PI	Dr. Maumita Bhaumik
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	Dr. Shanta Dutta
Funding Agency	DST-SERB
Period	2021-till date

Project title	Computational screening and experimental validation of autophagy modulators against *H pylori* infection: a novel approach
PI	Dr. Sushmita Bhattacharya
Names of CoI /CoPI / collaborators with name of collaborating institute(s)	Dr. Surajit Basak
Funding Agency	DHR GRANT IN AID
Period	2022-2025

Project title	Development of new therapeutic against *Vibrio cholerae* O1 which reduces pathogenesis
PI	Dr. Sushmita Bhattacharya
Names of CoI /CoPI / collaborators with name of collaborating institute(s)	
Funding Agency	Okayama University.
Period	2021 – till date

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Book Chapter

1. Roy D, Chakraborty N. Ethnomedicinal Approach against Human Cytomegalovirus Infection: A Search for Alternative Therapy. *Research Advances in Microbiology and Biotechnology Vol. 8*, 84–94.

Scientific Advisory Committee:

Chairperson	:	Prof. (Dr.) Pramod K. Garg Professor, Dept. of Gastroenterology, A.I.I.M.S., Ansari Nagar, New Delhi - 110029
Member	:	Dr. Yogesh Shouche Azim Premji University, Bengaluru
Member	:	Dr. V. Balaji Department of Clinical Microbiology, CMC, Vellore
Member	:	Prof. (Dr.) Sujata Sistla Professor, Department of Microbiology, JIPMER, JIPMER Campus Rd, Gorimedu, Dhanvantari Nagar, Puducherry - 605006
Member	:	Prof.(Dr.) Pallab Ray Former Professor and Head, Department of Medical Microbiology, PGIMER, Chandigarh-160012
Member	:	Prof. (Dr.) Uday Bandyopadhyay Former Director, Bose Institute, Kolkata, Ex-Professor, Division of Molecular Medicine Unified Academic Campus, Block EN - 80, Sector - V, Salt Lake, Kolkata 700091
Member	:	Prof. (Dr.) Shashi Kant Ex-Professor & HoD, Centre for Community Medicine, Room No.25, Old OT Block, All India Institute of Medical Sciences, Ansari Nagar, New Delhi - 110029
Member	:	Prof. (Dr.) Arun Kumarendu Singh Professor and Head, Department of Neonatology, AIIMS Jodhpur
Member	:	Prof.(Dr.) Suman K Dhar Professor, Special Centre for Molecular Medicine Jawaharlal Nehru University, New Delhi -110067
Member:	:	Prof.(Dr.) Dipshikha Chakravortty Professor, Department of Microbiology and Cell Biology Indian Institute of Science, Bangalore 560 012
Member	:	Dr. Shinjini Bhatnagar Distinguished Professor, THSTI, Faridabad
Member	:	Dr. Jacob John Emeritus Scientist, CMC, Vellore

Member	:	Prof.(Dr.) Kithiganahalli Narayanaswamy Balaji Professor, Department of Microbiology and Cell Biology, Convener, Centre for Infectious Disease Research (CIDR) Indian Institute of Science, Bangalore-560012
Member	:	Dr. Manoj Muhrekar Director, NIE, Chennai
ICMR Representative	:	Dr. Kamini Walia, Scientist-G, Division of ECD, ICMR Hqrs.
Member Secretary	:	Dr. Shanta Dutta, Director, ICMR-NIRBI

Institutional Ethics Committee:

Chairman	:	Prof. Santanu K. Tripathi, Dean (R&D and Lab Sciences) & Professor of Pharmacology, Jagannath Gupta Institute of Medical Sciences & Hospital, Budge Budge, Kolkata
Member Secretary	:	Dr. Phalguni Dutta Former Emeritus Medical Scientist (ICMR) ICMR-National Institute of Cholera & Enteric Diseases Beliaghata, Kolkata
Member, Basic Medical Scientist	:	Prof. Suparna Chatterjee Department of Pharmacology Institute of Post Graduate Medical Education and Research (IPGMER) AJC Bose Road, Kolkata
Member, Clinician	:	Prof. Santi Ranjan Bagchi Former-Prof. & Head, Dept. of Medicine College of Medicine & J.N.M. Hospital, Kalyani
Member, Basic Medical Scientist	:	Dr. Manideepa Sengupta Professor of Microbiology, Medical College Kolkata
Member, Clinician	:	Dr. Suman Kanungo, Scientist-E ICMR-National Institute of Cholera & Enteric Diseases, Beliaghata, Kolkata –700010
Member, Social Scientist	:	Mrs. Renuka Rath
Member, Legal Expert	:	Mrs. Saumya Ghosh
Member, Legal Expert	:	Mr. Chinmoy Guhathakurta
Member, Lay Person	:	Mrs. Anasuya Basu
Member, Lay Person	:	Mr. Tapan Kanti Sengupta

IEC- Biomedical & Health Research Committee:

Chairman	:	Prof. Santanu K. Tripathi, Dean (R&D and Lab Sciences) & Professor of Pharmacology, Jagannath Gupta Institute of Medical Sciences & Hospital, Budge Budge, Kolkata
Member Secretary & Basic Medical Scientist	:	Dr. Sandip Mukhopadhyay Scientist-E ICMR-National Institute of Cholera & Enteric Diseases, Kolkata –700010
Member, Clinician	:	Dr. Suman Kanungo Scientist-F ICMR-National Institute of Cholera & Enteric Diseases, Kolkata –700010
Member, Social Scientist	:	Ms. Monica Sharma Scientist-B ICMR-National Institute of Cholera & Enteric Diseases, Kolkata
Member, Basic Medical Scientist	:	Prof. Manideepa Sengupta Professor of Microbiology, Medical College Kolkata
Member, Basic Medical Scientist	:	Dr. Saibal Das Scientist D, ICAM
Member, Clinician	:	Prof. Sandip Samanta MSVP Dr. B.C. Roy Post Graduate Institute of Pediatric Sciences, Kolkata
Member, Social Scientist	:	Mrs. Renuka Rath
Member, Legal Expert	:	Mrs. Saumya Ghosh
Member, Legal Expert	:	Mr. Sudip Kumar Bhowmik
Member, Lay Person	:	Mr. Sibasis Dhar
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Institutional Animal Ethics Committee:

Chairperson, Biological Scientist	:	Dr. M.K. Chakrabarti Ex-Director-in-Charge & Ex-Emeritus Scientist, ICMR-NIRBI, Kolkata,
Member Secretary	:	Dr. Hemanta Koley, Scientist-F, ICMR-NIRBI, Kolkata
Member, Biological Discipline	:	Dr. Amit Pal, Scientist-F, ICMR-NIRBI, Kolkata
Member, Biological Discipline	:	Dr Santa Sabuj Das, Scientist-F, ICMR-NIRBI, Kolkata
Member, Veterinarian Member	:	Dr. Gautam Prasad Sarkhel, Uttranyan, Block D, Flat 2C, 40 Dum Dum Road, Kolkata
Member, Main Nominee, CPCSEA	:	Dr. Amirul Islam Mallick Dept. of Biological Sciences, IISER-K, Mohanpur, Nadia, West Bengal
Member, Link Nominee, CPCSEA	:	Dr. Shankar Maiti Dept. of Biological Sciences, IISER-K, Mohanpur, Nadia, West Bengal
Member, Scientist from outside Institute, CPCSE	:	Dr. Srimoyee Saha 36/C, Bosepukur Road, Kolkata
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

Institutional Biosafety Committee:

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

Internal Complaints Committee for Sexual Harassment of Women at Workplace:

Chairperson	:	Dr. Mamta Chawla Sarkar, Scientist-G
Member	:	Dr. Debjit Chakraborty, Scientist-E
Member	:	Administrative Officer
Member Secretary	:	Ms. Saheli Samanta, TO-C
Member	:	Ms. Arpita Sarbajna, TO-C
External Member from NGO	:	Ms. Suranjana Basu Das, Jt. Secretary, Lake Gardens Women and Children Development Centre

Right to Information Act (RTI) Committee:

RTI Appellate Authority	:	Dr. Amit Pal, Scientist-G
CPIO (Central Public Information Officer)	:	Dr. Sulagna Basu, Scientist-G
Nodal Officer of RTI Online Portal	:	Mr. T. S. Gopakumar, Admn. Officer
CPIO (Central Public Information Officer)	:	Mr. Sunil Bernard, Sr. Private Secretary
DPIO	:	Mr. Avijit Chakraborty, T.O - B

Grievance Cell:

Chairperson	:	Dr. Mamta Chawla Sarkar, Scientist-G
Member	:	Dr. Asish Kumar Mukhopadhyay, Scientist-G
Member Secretary	:	Mr. Tapas Pal, TO-C
Member	:	Administrative Officer
Member	:	Mr. Vishwanath Besra, Section Officer

Official Language Implementation Committee:

Chairperson	:	Dr. Shanta Dutta, Director & Scientist G
Acting Chairperson	:	Dr. Mamta Chawla Sarkar, Scientist-G
Member	:	Dr. Falguni Debnath, Scientist-E
Liaison Officer	:	Administrative Officer
Member	:	Ms. Arpita Sarbajna, TO-C

Member	:	Mr. Sunil Bernard, Sr. Private Secretary
Member	:	Mr. Sudhir Omesh, TO-A
Member	:	Mr. Vishwanath Besra, Section Officer

Web Committee

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

Website Security Monitoring Committee:

Chairperson	:	Dr. Ranajn Kumar Nandy, Scientist G
External Expert	:	Dr. Harpreet Singh, Scientist F & Head, BMI Division, ICMR Hq., New Delhi
Member	:	Dr. Sandipan Ganguly, Scientist G
Member Secretary	:	Mrs. Saheli Samanta, TO-C
Member	:	Dr. Nilanjan Chakraborty, Scientist-F
Member	:	Dr. Debjit Chakrabarty, Scientist E
Member	:	Administrative Officer

SC/ST Cell

Chairperson/ Liaison Officer	:	Dr. Amit Pal, Scientist G
Member	:	Dr. Sandipan Ganguly, Scientist G
Member	:	Dr. Pallavi Indwar, Scientist D
Member	:	Mr. Vishwanath Besra, Section Officer
Member	:	Mr. Dipak Kr. Gayen, Section Officer

OBC Cell

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Member	:	Dr. Moumita Dutta, Scientist D
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Library committee

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Member	:	Dr. Provash Chandra Sadhukhan, Scientist-F
Member	:	Dr. Moumita Bhaumick, Scientist-D
Member	:	Dr. Surajit Basak, Scientist-D
Member	:	Mr. Prosenjit Guha, Assistant
Member	:	Administrative Officer
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Member	:	Store-in-Charge, ICMR-NIRBI

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Member	:	Dr. Ranjan Kr. Nandy, Scientist-G
Member Secretary	:	Administrative Officer
Member	:	External Legal Expert
Member	:	Mr. Viswanath Besra, Section Officer

Staff List

Scientists:
Dr. S. Dutta, Scientist G & Director
Dr. A. Pal, Scientist G
Dr. R. K. Nandy, Scientist G
Dr. A.K. Deb, Scientist G
Dr. A. K. Mukhopadhyay, Scientist G
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 F
Dr. S. Kanungo, Scientist F
Dr. P. C. Sadhukhan, Scientist E
Dr. A. K. Chakrabarti, Scientist E
Dr. S. Mukhopadhyay, Scientist E
Dr. D. Chakraborty, Scientist E
Dr. F. Debnath, Scientist D
Dr. M. Bhaumik (Ghosh), Scientist D
Dr. M. Dutta, Scientist D (resigned on 31.08.2023)
Dr. S. Basak, Scientist D
Dr. P. Indwar, Scientist D
Dr. A. Majumdar, Scientist C
Dr. S. Bhattacharya, Scientist C
Dr. M. G. Lewis, Scientist C
Dr. M. Bardhan, Scientist B (resigned on 31.05.2023)
Dr. S. Chakraborty, Scientist B
Dr. Jutang Babat Ain Tiewsoh, Scientist B (resigned on 18.12.2023)
Ms. Monica Sharma, Scientist B

Bacteriology Division
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-B
Ms. M. Das, Technical Assistant
Mr. Rakesh Dey, Technical Assistant
Mr. A. Kool, Technical Assistant
Mr. S. Nandy, Technical Assistant
Ms. Y. P. Upadhyaya, Technical Assistant
Mr. P. Samanta, Laboratory Assistant
Mr. S. Dey, Laboratory Assistant-1 (posted at Pay bill section)

Clinical Medicine Division
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Ms. Megholi Roy, Technical Assistant
Mr. K. K. Roy, Laboratory Assistant
Mr. K. G. Saha, Laboratory Assistant
Mr. A. Pramanik, Laboratory Assistant

Electron Microscopy Division
Ms A. Sarbajna, TO-C
Ms. Anaswara Ramesh, Technical Assistant
Mr. B. R. Mallick, Laboratory Assistant-1 (posted at Bill Section)

Epidemiology and Data Management Division
Mr. C. Mandal, Sr. Technical Officer-B
Mr. A. Chakraborty, Technical Officer -B (Posted at Personnel Section)
Ms. Sanjuckta Pramanick, Technical Assistant
Ms. Dipayani Sain, Technical Assistant
Ms. Prajnashri Bhir, Technical Assistant
Ms. Dipti Yadav, Technical Assistant
Dr. Khushboo Dewangan, Technical Assistant
Ms. Shreya Pati, Technical Assistant

Biochemistry Division
Mr. M. Das, Technical Assistant

Immunology Division
Ms. Usha Hansdah, Technical Assistant
Mr. N. C. Mondal, Laboratory Assistant

Parasitology Division
Mr. Abhishek Kumar, Technical Assistant
Mr. B. Ganguly, Technician 2

Pathophysiology Division
Mr. R. Kumar, Technical Assistant
Mr. B. Roy, Sr. Technician (1)

Virology Division
Mr. S. Omesh, Technical Officer –A
(Posted at Store section)
Ms. P. Bhaumik, Technical Officer B
Ms. P. De, Technical Officer-B
Mr. T. Gupta, Technical Officer-A
Mr. K. Sen, Technical Assistant
Ms. Bansiewdorlin Lyngkhei, Technical Assistant
Ms. S. Mondal, Technical Assistant
Mr. Siddharth Bhardwaj, Technical Assistant
Mr. Inbanathan A, Technical Assistant
Mr. Anirban Saha, Technical Assistant
Md Maruff Hossain, Technical Assistant
Md. M. Hossain, Sr. Technician (1)
Mr. P. Turi, Laboratory Assistant
Ms. C. Das, Laboratory Assistant

Library:
Ms. S. Samanta, TO-C
Mr. T. Pal, TO-C
Mr. S. K. Routh, Laboratory Assistant

Department of Animal House
Dr. Narayanan S B, Technical Assistant
Mr. R. Hazra, Laboratory Assistant
Mr. S. Balmiki, Laboratory Assistant

Maintenance, Instruments & Equipment Section
Mr. Suman Ghosh, Technical Assistant (ES)
Mr. Debabrata Naskar, Technical Assistant (ES)
Mr. Abdul Latif, Technical Assistant (ES)
Mr. Soumen Mondal, Technical Assistant (ES)
Mr. K. Dey, Sr. Technician-2 (retired on 31.01.2024)
Mr. B. Mandi, Laboratory Assistant
Mr. S. Hazra, Laboratory Assistant
Mr. A. Das, Laboratory Assistant
Mr. B. Moshi, Laboratory Assistant
Mr. B. Hela, Laboratory Assistant
Mr. A. Seal, Laboratory Assistant-1
Mr. S. Maiti, Laboratory Assistant

Media Section
Mr. K. Ghosal, Laboratory Assistant
Mr. S. Mondal, Laboratory Assistant

ICMR Virus Laboratory
Mr. R. Hela, Laboratory Assistant

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

Office of the Administrative Officer
Mr. T. S. Gopakumar, Sr. AO
Mr. S. Naskar, Stenographer
Mr. R. Jaiswal, Upper Divisional Clerk
Mr. Omkar Lal, Laboratory Assistant

Accounts Section
Mr. R. Chowdhury, Jr. ACO (retired on 30.09.2023)
Mr. M. K. Gogoi, ACO (joined on 01.02.2024)
Mr. D. Kumar Gayen, Section Officer
Mr. S. Mullick, Assistant
Mr. A. Banerjee, Technician-2

Cash Section
Mr. A Chandra, Assistant
Mr. M. S. Das, Lower Division Clerk

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

Training & Extension
Mr. S. Adhikary, Laboratory Assistant

Establishment Section
Ms. S. Samanta, TO-C (additional charge)
Mr. A Chaurasia, Assistant
Mr. B. Ganguly, Technician (2) (first half duty)
Mrs. M. Bhattacharya, Lab Assistant (retired on 31.05.2023)

Store Section
Mr. S. Omesh, Technical Officer-A
Mr. C. Mandal, TO-B
Mr. Sayak Majumdar, Assistant
Mr. Arnab Nag, Assistant

Personnel Section
Mr. V. Besra, SO
Mr. A. Chakraborty, Technical Officer-B
Mr. P. Guha, Assistant
Mr. Rahul Kumar, Assistant
Ms. S. Pati, Technical Assistant
Mr. R. Hela, Laboratory Assistant

Pension Section
Mr. K. Sharma, Assistant

Vehicle Section
Mr. D. K. Chowdhury, Sr. Technician 3 (retired on 31.10.2023)
Mr. H. P. Das, Sr. Technician 3
Mr. A. K. Dutta, Sr. Technician 2
Mr. R. Bhakta, Sr. Technician 3
Mr. S. Das, Sr. Technician 1
Mr. D. Dey, Technician 2

Scientists Associated with ICMR-NIRBI
Dr. Chhabi Choudhury Bose, Research Officer (HRRC Staff retired on 31.05.2023)
Dr. Amit Kumar Chakraborty, Research Officer (HRRC Staff)
Dr. A. Chanda, Research Officer (HRRC Staff)
Dr. S. Saha Roy, Demographer (HRRC Staff)

Dr. A. Ghosh, J.C. Bose Distinguished Chair, Professor, National Academy of Science, India
Dr. T. Ramamurthy, INSA Sr. Scientist
Dr. P. Das

Staff Associated with ICMR-NIRBI
Mr. Nemai Das, Driver
Mr. Padma Lochan Nayak, Driver

Employees who Joined ICMR-NIRBI during 2023-24

Name	Designation	*Date of Joining*
Mr. Sanku Naskar	Stenographer	01.04.2023
Mr. Ayanna Chourasia	Assistant	21.09.2023
Mr. Sayak Majumdar	Assistant	16.10.2023
Mr. Rahul Kumar	Assistant	27.09.2023
Mr. Arnab Nag	Assistant	29.09.2023
Ms. Sanjuckta Pramanick	Technical Assistant	19.01.2024
Ms. Dipayani Sain	Technical Assistant	19.01.2024
Ms. Bansiewdorlin Lyngkhei	Technical Assistant	22.01.2024
Mr. Debabrata Naskar	Technical Assistant	22.01.2024
Ms. Sudipta Mondal	Technical Assistant	23.01.2024
Mr. Mrinmoy Das	Technical Assistant	23.01.2024
Mr. Rakesh Dey	Technical Assistant	24.01.2024
Ms. Prajnashri Bhir	Technical Assistant	24.01.2024
Mr. Anirban Kool	Technical Assistant	25.01.2024
Mr. Abdul Latif	Technical Assistant	25.01.2024
Ms. Megholi Roy	Technical Assistant	25.01.2024
Mr. Soumen Mondal	Technical Assistant	29.01.2024
Mr. Siddharth Bhardwaj	Technical Assistant	29.01.2024
Mr. Rishikesh Kumar	Technical Assistant	29.01.2024
Mr. Inbanathan A	Technical Assistant	30.01.2024
Mr. Souvik Nandy	Technical Assistant	30.01.2024
Ms. Anaswara Ramesh	Technical Assistant	30.01.2024
Ms. Dipti Yadav	Technical Assistant	30.01.2024
Dr. Khushboo Dewangan	Technical Assistant	30.01.2024
Ms. Yesha Parasmani Upadhyaya	Technical Assistant	31.01.2024
Dr. Narayanan S B	Technical Assistant	31.01.2024
Ms. Usha Hansdah	Technical Assistant	01.02.2024
Mr. Anirban Saha	Technical Assistant	02.02.2024
Ms. Shreya Pati	Technical Assistant	16.02.2024
Mr. Abhishek Kumar	Technical Assistant	15.03.2024
Mr. Md. Maruf Hossain	Technical Assistant	18.03.2024
Ms. Sudipta Pati	Technical Assistant	19.03.2024
Mr. Suman Ghosh	Technical Assistant	19.01.2024

Employees who retired from ICMR-NIRBI during 2023-24

Name	*Designation*	*Date of retirement from service*
Smt. Minoti Bhattacharya	Laboratory Assistant	31.05.2023
Dr. Chhabi Choudhury Bose	Research Officer (HRRC Staff)	31.05.2023
Mr. Ratan Chowdhury	ACO (Jr. Grade)	30.09.2023
Mr. Dilip Kumar Chowdhury	Sr. Technician (3)	31.10.2023
Mr. Kanu Dey	Sr. Technician-2	31.01.2024
Mr. Ranjit Bhakta	Sr. Technician (3)	29.02.2024

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

Name of the Employee	Designation	Date of Retirement/VR	Passed Away on
Mr. S. N. Sikder	Ex-Deputy Director	28.02.1997	08.10.2023
Mr. Kanailal Das	Ex-TA	31.03.1996	14.08.2023
Mr. Jahuri Lal	Ex-Head Sweeper	28.02.2001	17.01.2024
Mr. Subhendu Ghosh	Ex-ACO	31.03.2001	13.12.2023
Mr. Gouranga Bose	Ex-Sr. Driver	31.08.2005	05.10.2323
Dr. Sujit Kumar Mondal	Ex-Deputy Director	30.11.2007	20.11.2023
Mr. Joglal Ram	Ex-Lab. Tech.	31.10.2010	06.02.2024
Mr. Krishna Biswas	Ex-TA	31.10.2010	14.02.2024
Dr. Triveni Krishnan	Ex-Scientist F	30.04.2018	05.11.2023
Mr. Subal Turi	Ex-Lab. Assistant	30.11.2021	13.11.2023