

ICMR-NICED

ACHIEVEMENT & ACTIVITY REPORT

2022-23



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NATIONAL INSTITUTE OF
CHOLERA AND ENTERIC DISEASES

आई.सी.एम.आर – राष्ट्रिय कॉलरा और आंत्र रोग संस्थान
ICMR-National Institute of Cholera and Enteric Diseases

स्वास्थ्य अनुसंधान विभाग / Department of Health Research
स्वास्थ्य और परिवार कल्याण मंत्रालय / Ministry of Health & Family Welfare
भारत सरकार / Government of India

WHO Collaborating Centre for Research and Training on Diarrhoeal Diseases

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

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Dr. Debjit Chakraborty, Scientist D	Member
Mrs. Saheli Samanta, TO-C	Member
Mr. Tapas Pal, 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 spring of 2022 brought new hopes as we had successfully won the battle against COVID 19 due the untiring efforts and resilience of frontline workers and the initiatives taken by the National Government. The scientists worldwide adapted in an unprecedented way of fast delivering diagnostics, vaccines and therapeutics to COVID19 cases within a short time. During post COVID19, the responsibility is even more to protect the population from any such emerging microbes capable of causing huge loss of lives, services, logistics and innovations, which are fundamentals to human progress. ICMR-NICED is still continuing surveillance and research on circulating SARS CoV2 virus to monitor emergence of new variants causing any outbreak in the region.

ICMR NICED initiated studies on various health priorities of public health importance like gastrointestinal infectious, antimicrobial resistance (AMR), vaccine trials and viral diseases through VRDL (Viral Research Diagnostic Labs). Mapping of cholera case distribution in India was conducted through triangulation of serosurvey data with data from other available sources. The overall recent annual infection (RAI) of cholera in India was 11.7% highlighting the need for targeted introduction of oral cholera vaccine (OCV) in hotspot areas of India. Multicentric phase 3 open-label randomized parallel-group comparative clinical trial for immunogenicity of killed oral cholera vaccine Euvichol-plus was conducted by a bridging study for licensing of OCV in India following the safety and immuno genicity results compared with licentiate commercially available vaccine ShanChol. A food borne pathogen surveillance has been launched by NICED, which is monitored throughout the year for predicting emergence of any foodborne disease outbreak in north-eastern states.

Due to the increasing global threat of AMR, NICED has prioritized multidisciplinary studies to mitigate AMR. National Repository of Antimicrobial Resistant Bacteria (NRAMRB) with its web portal has been developed. The repository has been receiving antibiotic resistant bacterial strains from nodal centres of AMR Surveillance Network (AMRSN) of ICMR and other research organizations across the country for confirmation of identification and characterization. The NGS facility housing the ION S5 Gene Studio has been initiated at the repository for whole genome sequencing and analysis of the strains. Encouraging the Antimicrobial Stewardship program at all tiers of health care delivery system in West Bengal has generated interesting data on types of organisms isolated and their AST profiles for common infections like diarrhoeal diseases, urinary tract infection, ARI, and enteric fever, for developing infection specific algorithm for antibiotic prescription. Studies have identified carbapenem resistance blaNDM-5 gene in the commensal *Escherichia coli* from diarrheal patients which is really worrisome since it has the potential to transfer this resistance gene to other pathogenic as well as non-pathogenic bacteria residing in the gut. A POCT for detection of UTI was validated in afield study and was found to have potential to curtail the antibiotic prescription. Studies have also reported identification and characterization of NDM-1-producing hypervirulent *Klebsiella pneumoniae* (hvKP) and carbapenem resistant *Enterobacter cloacae* in sepsis patients. NICED contributed in preparing a state-of-the-art document on Priorities of the Environmental Dimension for mitigating Antimicrobial Resistance (AMR) in India under UNEP to inform policy makers for formulating revised National Action Plan (2023-2027) including the environmental component.

NICED continued to provide virus diagnostics and genotyping service to the state of West Bengal and other Eastern states through regional VRDL. A reduction ($\approx 35\text{-}40\%$) in rotavirus infection and emergence of sapovirus was observed among children after RV vaccine was introduced in WB. A recombinant adenovirus 7/3 was identified through genome sequencing as the cause of severe acute respiratory outbreak with high mortality among children in and around Kolkata during Dec 2022- March 2023. HCV drug resistance-associated amino acid substitutions among the local circulating HCV strains have been identified that will help in better management of HCV patients thus achieving HCV elimination goal by 2030.

Few products that have been developed at NICED are diagnostic assays for identifying multiple enteric parasites, nested PCR for identifying clarithromycin resistant *H. Pylori* from biopsy samples, Lamp based assay for detection of Cholera, gold nanoparticle-aptamer complex based detection of HCV in blood samples were successfully developed and validated. Molecular detection method identified emergence of *E. moshkovskii* in the region. Anti-cancer activity of microbial extracellular proteases such as subtilisin and M84 isolated from environmental microbes was established. Additionally, herbal compounds and bacteriophages have been identified and tested to combat antimicrobial resistance activity against *Shigella* species, *Salmonella* spp, *H. pylori*, enteric parasites and rotavirus *in vitro* and *in vivo* animal models.

In this financial year, NICED has published 71 research articles and 2 book chapters. The average impact factor 6.626, with highest impact factor 98.4 (2023). A total of 36 extramural projects funded by National/International agencies have been executed by the scientists.

In addition to research, NICED is also involved in capacity building in the field of biomedical research. During 2022-23, 64 PhD students were trained at ICMR-NICED and 9 students were awarded PhD degree. A total of 1250 participants including medical doctors and health care workers were trained through 15 workshops and training programs. A total of 80 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. On request of ASCODD Secretariat, NICED successfully hosted an International Conference entitled "16th Asian Conference on Diarrheal Diseases and Nutrition (ASCODD)" during 11-13 November 2022, where approx. 500 national and international delegates participated and exchanged their views and opinion on recent advances in enteric diseases, enteric pathogens and antimicrobial resistance. With the changing National health priorities in recent years, NICED has been expanding its research focus towards translational component research like development of vaccine candidates, alternative therapeutics and diagnostics with an aim to mitigate AMR.

During this journey of ICMR-NICED, contributions of all (both in service and retired) scientific, non-scientific staff and the research fellows are gratefully acknowledged which enabled the institute to make a substantial impact at the national level w.r.t. reduction in mortality and morbidity of enteric diseases.

Shanta Dutta

Director

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S. Dutta (Principal Investigator), Bacteriology Division

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

Sphingosine-1-phosphate (SIP), a bio active sphingolipid derivative, is ubiquitously expressed and degraded by SIP lyase irreversibly. SIP activates a family of G protein-coupled receptors, known as S1PR1–5. The role of SIP in gut homeostasis mainly focusing on gut barrier regulation and immunity has been investigated. SIP signalling was inhibited by Fingolimod (FTY720) which is a pharmacological inhibitor. Upon FTY720 treatment, the trans electrical resistance of the HT-29 colon adenocarcinoma cell layers was measured. Western blot analysis and real-time-PCR were performed for the tight junctional protein expression analysis. For in vivo study, C57BL/6 mice were fed with FTY720 (3mg/kg) for 14 days. Immuno-histo staining of tight junctional proteins was done for normal and treated mice. From the data, it was concluded that SIP plays an important role in tight junction protein synthesis and therefore helps in barrier maintenance at the epithelial cell layer. Inhibition of SIP synthesis and SIP signalling may lead to gut barrier disruption which may lead to gut inflammation.

Study on characterization of Carbapenem Resistant *Enterobacter cloacae* isolated from blood of sepsis patients admitted in Intensive Care Unit of Tertiary care Hospitals in Kolkata

Majority of sepsis cases are caused by Multi Drug Resistant Gram- Negative Bacilli (MDR-GNB). Carbapenems, reserved as "last-line" antibiotic group, have the broadest spectrum of activity and the greatest potency, but resistance to carbapenems are on the rise and is a serious health concern. A total of 70 non-duplicate CR-*Enterobacter cloacae* complex (CR-ECC), collected from different tertiary care hospitals in Kolkata during Jan 2017- Dec 2022, were included in this study. Isolated CR-ECCs were identified by biochemical assays and confirmed by VITEK-2. Antibiotic Susceptibility Testing was performed using the Kirby Bauer disk diffusion and by Minimum Inhibitory Concentrations of the carbapenem groups of antibiotics (Imipenem, Meropenem, Doripenem, Ertapenem). MLST was performed based on 7 housekeeping genes (*gyrB*, *dnaA*, *fusA*, *leuS*, *pyrG*, *rpoB*, *rplB*). Whole genome Shotgun sequencing (WGS) analysis was conducted by illumine Novaseq6000.

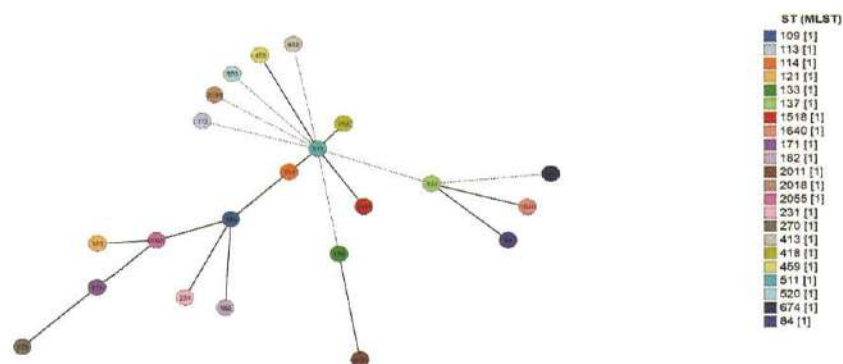


Fig 1: Phylogenetic relationship among the obtained STs (Sequence Types). The color pallet denoting individual ST is on the right side. It is observed from ST 511, the different obtained STs are generated.

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

- Attended Initiation Ceremony of Proposed International University of Public Health and Technology (IUPHT) on 02/04/2022 at I3T, Kolkata
- Attended Workshop (Japan), “Antimicrobial Resistance (AMR) and implications for human and environmental health in Asia”, funded by the European Union held on 7-8 April 2022 via videoconference
- Attended The 7th meeting of the Global Task Force on Cholera Control (GTFCC) Working Group on Surveillance (Epidemiology and Laboratory) held from 20-21 April, 2022.
- Virtually attended the meeting of the 10th Technical Research Group (TRG) of Lab Services Division of National AIDS Control Organization on 26th April, 2022
- Attended WHO Performance Evaluation Laboratories (PEL) Virtual meeting on 5th May, 2022.
- Physically attended the meeting of the Technical Research Group (TRG) of Surveillance & Epidemiology of National AIDS Control Organization (NACO) on 11th May, 2022
- Physically attended the meeting to discuss the proposal for construction of a BSL-3 Lab under the regional VRDL and feasibility of the proposed Lab at NICED on 11th May, 2022 at ICMR Hqrs.
- Attended WHO Performance Evaluation Laboratories (PEL) Virtual meeting on 12th May, 2022.
- Attended Workshop on Health Technology Assessment organized virtually by ICMR-RMRC, Gorakhpur on 17-18 May, 2022
- Attended Online workshop (China) “Promoting best practices to tackle antimicrobial resistance (AMR) in Asia from a One Health perspective: Research and Innovation”, funded by the European Union, held on 24-25 May 2022 in Beijing, via videoconference.
- Attended the second edition of the gender series on “Women, the Future of Work: Upskilling for a post-pandemic world” virtually organized by the Indian Express on 25th May, 2022
- Attended the 75th World Health Assembly held during 22-28 May, 2022 in Geneva and the Cholera Side-event held at IFRC headquarters in Geneva on 25th May, 2022 from 6-8 pm Geneva time.
- Delivered a talk entitled “Unsung Great Scientist of India: Dr.Sambhju Nath De” at The Ramakrishna Mission Institute of Culture under the auspices of the Vivekananda Science Circle on 27th May, 2022.
- Attended a consultation to discuss knowledge gaps and priority research questions for Monkeypox research organized by the WHO R&D Blueprint on 2nd and 3rd June, 2022
- Attended an Awareness Workshop on “Guiding Principles towards Effective Intellectual Property Management, Licensing & Collaborations” with special reference to Intellectual Property & Technology Management by ICMR-Medical Device Diagnostics Mission Secretariat (MDMS) held on 7th June, 2022 at ICMR-Hqrs.
- Attended “Antimicrobial Resistance in the Environment Webinar Series”, entitled “Understanding the basics for national action”, organised by The Quadripartite, the Food and Agriculture Organization of the United Nations (UNFAO), the United Nations Environment Programme (UNEP), the World Health Organization (WHO) and the World Organisation for Animal Health (WOAH) on 14th June, 2022
- Attended Global Task Force on Cholera Control (GTFCC) Working Group on Oral Cholera Vaccine virtual meeting on 16th June, 2022
- Invited to deliver a talk on “Covid-19 pandemic response in India” at NIOH, Ahmedabad on 22nd June, 2022 (18-23 June 2022)
- Attended the 9th Annual meeting of the Global Task Force on Cholera Control (GTFCC) held during 27-29 June, 2022 in hybrid format
- Attended the “Health Communication Conclave: Connect and Collaborate” hoisted by ICMR held on July 15, 2022 at Multipurpose Hall, India International Centre, New Delhi
- Attended the Sixth meeting of NACO's Technical Working Group (TWG) on Surveillance & Epidemiology held on 19-20th July, 2022
- Attended the 10th Convocation of the NIPER, Kolkata at National Institute of Technical Teachers' Training & Research Auditorium, Salt Lake on 22nd July, 2022
- Attended the 5th meeting of the Typhoid Working Group, National Technical Advisory Group on Immunization (NTAGI) held on July 29, 2022 (virtual)

- Attended The WHO R&D Blueprint a consultation to discuss "WHO Monkeypox research: What study designs can be used to address the remaining knowledge gaps for monkeypox vaccines?" on 2nd August, 2022
- 1st Technical Resource Group (TRG) meeting on the collaborative project on "Sexually Transmitted Infections among High-Risk Group populations in India: Systematic Review" from 11-12 August, 2022 at ICMR-NICED, Kolkata
- Webinar on "Scientific strategies from recent outbreaks to help us prepare for Pathogen X Confirmation" organized by WHO R&D Blueprint Secretariat held on 29-30 August, 2022
- TROPACON 2022: Pre-conference Workshop on Molecular Techniques and Special strains on 22nd September, 2022 at ICMR-NICED.
- 2nd and Final TRG meeting on Sexually Transmitted Infections among Key populations in India: Systematic Review on 22-23 September, 2022.
- GTFCC Virtual OCV WG meeting to be held on 22nd September, 2022.
- Chairing a session for the Panel Discussion on Artificial Intelligence on 23th Sept. 2022 at the "TROPACON 2022", the XVth National Conference of the Indian Academy of Tropical Parasitology" organized by IATP-WB Chapter to be held on 23 & 24th September, 2022 in Kolkata & pre-conference workshops on 21st & 22nd September, 2022.
- National Expert Consultation on Research component of National Action Plan on Antimicrobial Resistance (NAP-AMR) on 26-27 September, 2022 organized by the National Centre for Disease Control, the Nodal Agency for AMR, Department of Biotechnology and Indian Council of Medical Research in collaboration with the WHO India, and the USAID-supported Infectious Diseases Detection and Surveillance (IDDS) project.
- NACO Expert Consultation to revisit definition of 'Ending AIDS as a Public Health Threat' under NACP on 30th Sept and 1st October, 2022
- Media Training organized by ICMR Communication Unit in support with GHS (2nd round) at NIRRH, Mumbai during 10-11 October, 2022
- Indian Immunology Society Golden Jubilee Online Lecture Series "Mission Oriented Research" by Prof. G.P. Talwar on 14/10/2022.
- 1st Task Force Meeting on Whitepaper on Responsible Antimicrobial Manufacturing Platform organized by the Confederation of Indian Industry (CII) on 26th October, 2022.
- 3rd Webinar of the "Antimicrobial Resistance in the Environment Webinar Series", entitled "Technical solutions for the prevention and control of AMR in the environment", organised by The Quadripartite, the Food and Agriculture Organization of the United Nations (FAO), the United Nations Environment Programme (UNEP), the World Health Organization (WHO) and the World Organisation for Animal Health (WOAH) on 27 October 2022.
- Chief Guest in the inaugural session of the International Conference on Biotechnology and Biological Sciences, "BIOSPECTRUM" organized by the Department of Biotechnology, University of Engineering and Management (UEM) during 5th to 7th November, 2022
- TRG-Lab Services Division, NACO on 14th November, 2022.
- Virtually joined the meeting with partners and regional institutes on preparatory activity for Pilot Projects of Size Estimation under NACP organized by the NACO on 15th November, 2022
- Local Research Advisory Committee (LRAC) meeting of MRU, R.G. Kar Medical College & Hospital, Kolkata on 16th November, 2022
- Virtually delivered a talk on "Microbiome as a tool to address Antimicrobial Resistance (AMR) threats" in the international seminar on "Interventions for control of AMR: Harnessing one health knowledge" organized by ICAR-Central Institute of Fisheries Technology during 21-22 November, 2022 at Kochi.
- 4th Webinar of the "Antimicrobial Resistance in the Environment Webinar Series", entitled "Governance approaches for prevention and control of AMR in the environment" organized by the Quadripartite, the Food and Agriculture Organization of the United Nations (FAO), the United Nations Environment Programme (UNEP), the World Health Organization (WHO) and the World Organisation for Animal Health (WOAH) on 1st December 2022.
- International Meet on "Preparedness for Future Epidemics: Is India ready to meet the CEPI 100 days vaccine challenge?" at the THSTI, Faridabad on 5-6 December, 2022.

- Chairing the 1st Phase of Pre-surveillance site level training (ANC sites) of WBSAPCS at IIHM, Kolkata on 8th December, 2022.
- A meeting organised by UNEP for interaction between Ministry of Environment, Forest and Climate Change (MoEF&CC), National Centre for Disease Control (NCDC), ICMR-National Institute of Cholera and Enteric Diseases (ICMR-NICED), our global team, and experts from John Hopkins University to discuss global policy experience on addressing environmental aspects of antimicrobial resistance (AMR) on 20 December 2022 (15:00-16:00 PM IST).
- Chaired a Site level training on HIV Sentinel Surveillance 18th round of CG-SACS at Raipur on 22nd December, 2022
- Invited to share expertise on the EU Market Study on the Impact of the Pharmaceutical Industry on AMR in India conducted by the European Union on 23rd December, 2022
- Panelist for a panel discussion titled "Regulatory Endeavours" as part of upcoming 2023 Kolkata Technology Showcase is an in-person event hosted by the IKP-PRIME, IKP Knowledge Park, co-sponsored by RISE IISER Kolkata which will be held on 12 January 2023 at the Empress, Fairfield by Marriott, Newtown, Kolkata.
- WHO SEARO meeting to discuss the current situation of cholera in the region and support that could be leveraged from NICED as a WHO CC in WHO's efforts to support prevention and control on 18th January 2023.
- 3rd Taskforce Meeting on Responsible Antimicrobial Manufacturing Platform organized by CII on 2nd February, 2023.
- Visit to ICMR-HQ to attend one meeting with Japanese counterpart on 14th February, 2023
- A Regional Consultation meeting for prioritizing diseases for elimination in India organized by ICMR-NARI in collaboration with ICMR HQ on 21st and 22nd February, 2023
- Wellcome and the Global Task Force on Cholera Control (GTFCC) Secretariat a virtual event focused on understanding the role of climate change in cholera transmission and outbreaks on 22-23 February, 2023
- Attended a meeting for developing collaborative research activity on cholera at Modi Medical College, Ahmedabad on 28th February, 2023
- Post Budget Webinar by the Ministry of Health and Family Welfare (Lead) and D/o Pharmaceuticals (Co-Lead) on Budget Announcements (FY 2023-24) regarding Health & Medical Research on 6th March, 2023.
- Invited to participate in the Celebration of Women's Day – Press Conference organized by the Press Information Bureau on 6th March, 2023 at Press Club Kolkata.
- Fourteenth International Rotavirus Symposium, Bali, Indonesia (14-16 March, 2023) organized by Sabin Vaccine Institute, USA
- Zonal Stakeholder meeting on Prevention and Control of Influenza and Other Respiratory Viruses – East Zone on 21-22 March, 2022 at Hyatt Regency, Kolkata

Post and Pre-Doctoral Fellows:

Dr. Deotima Sarkar, PDF-ICMR

Pre-Doctoral Fellow:

Ms. Sohini Sikder, SRF-CSIR

Mr. Gourab Halder, SRF

Ms. Paulami Dutta, SRF-ICMR

Ms. Sunayana Saren, SRF-UGC

Ms. Arunima Sengupta, Project Research Assistant

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

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

Loop-mediated isothermal amplification (LAMP) assay has been established for the detection of *Vibrio cholerae* O1. The newly developed assay is working with 100% sensitivity and specificity when tested with pure cultures of *V. cholerae* O1 as positive detection and other vibrios and *Escherichia coli* strains as negative detection. The assay has been standardized to detect 10^3 CFU of *V. cholerae* O1 per 25 μ l reaction volume in 20 min. Fig. 2 shows positive detection of *V. cholerae* O1 with varied amounts of CFU used for the assay.

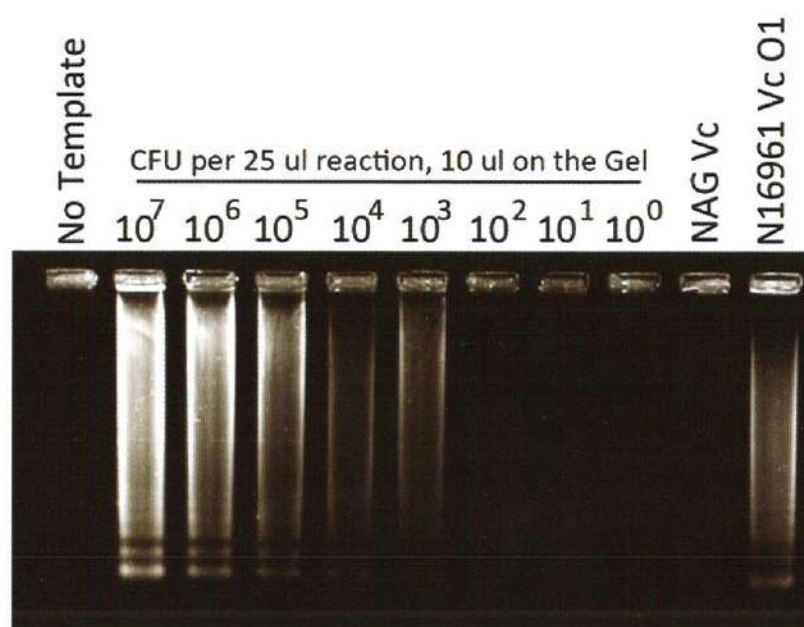


Fig.2: Agarose gel electrophoresis patterns of amplified DNA from *V. cholerae* O1 specific LAMP assay. Detection of smear or ladder patterns indicated LAMP positivity. *V. cholerae* O1 and *E. coli* strains served as positive and negative controls respectively.

Randomized Clinical Study to Compare the Immunogenicity and Safety of Euvichol-Plus Vaccine with Oral Cholera Vaccine Shanchol.

This regulatory trial assessed Oral Cholera Vaccine (OCV) Euvichol-Plus's comparative immunogenicity with Shanchol in healthy Indian adults and children. All subjects were followed up and blood samples were collected on '0' days, '14 days', and '28 days' to assess induction of the vibriocidal titer against *V. cholerae* O1 Inaba, Ogawa, and O139. This study was performed in a non-inferiority trial design for an evaluation of new vaccine Euvichol-plus against Shanchol. This was for a proposed registration study in India, which will allow the use of new Euvichol-Plus in India which is similar in composition to Shanchol but come in a single-use plastic tube presentation, for easy administration. Upon completion of analysis, data will be published. Shanchol was marketed by Shanta Biotechnics and afterward, Shanta Biotechnics was acquired by Sanofi Pasteur. It is pertinent to mention here that Sanofi Pasteur, the current manufacturer of Shanchol declared that production of Shanchol will be discontinued in 2023. Therefore, the supply of a safe and effective OCV in India is in demand. Data generated from this study will fulfill the Indian licensure requirement for the use of Euvichol-plus.

Awards/ Honours received

- SK Mjtra Birth Centenary Award conferred in 2023 by The Indian Science Congress Association on January 2023.

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

- iGOT Karmayogi portal training on 'Code of conduct for Government Employees' by Institute of Secretariat Training and Management from 23-03-23 to 23-03-23
- iGOT Karmayogi portal training on 'Prevention of Sexual harassment of Women at the Workplace' by Institute of Secretariat Training and Management from 16-03-23 to 16-03-23
- Organized and participated in Hands-On Training On eLeave and eOffice For ICMR-NICED Staff; Representative from ICMR hqrs. joined the training from 10-03-23 to 10-03-23
- Joined ICMR webinar on Non-inferiority Trials on Clinical Studies & Trials Unit, ICMR from 02-03-23 to 02-03-23
- Joined Webinar on Standard Treatment Workflows- on Gastroenterology for the use of physicians, ICMR from 10-02-23 to 10-02-23
- Joined Webinar on Implementation Research, ICMR from 25-01-23 to 25-01-23
- Organized a seminar on 'Cyber Hygiene' at ICMR-NICED from 09-12-22 to 09-12-22
- Joined the meeting on 'Management of Assets of Drinking Water Supply System' by the Bureau of Indian Standards from 24-11-22 to 24-11-22
- Organizing member of 16th Asian Conference on Diarrheal Diseases and Nutrition (ASCODD), organized by ICMR-NICED along with IICB and Bose Institute from 11-11-22 to 13-11-22
- Joined Webinar on Ethical and Regulatory Aspects of a Clinical Trial, ICMR from 02-11-22 to 02-11-22
- Joined Webinar on "Awareness on Cyber & Data Security, DHR from 06-10-22 to 06-10-22
- Participated Online- 31st meeting of FAD 14 by Bureau of Indian Standards from 26-07-22 to 26-07-22

Post and Pre-Doctoral Fellows:

Pre-Doctoral Fellow

Mr. Imran Alam, JRF-UGC

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. The present study assessed the protective efficacy of fish oil-in-water nanoemulsion, compared to the conventional emulsion, towards the intestinal epithelial barrier against invasive infection of *Salmonella enterica* serovar Typhimurium strain SL1344 in an in vivo streptomycin-treated mouse model. Non-typhoidal *Salmonella enterica* serovar Typhimurium strain SL1344 expresses its invasiveness by creating extreme inflammatory assault in the mammalian host lumen via its repertoire of secretory or membrane-bound proteins. Prophylactic treatment of ω -3 polyunsaturated fatty acid-rich fish oil nanoemulsion not only reduced the inflammatory markers by 4–5 fold against the established infection but also retained the gut barrier efficiency as shown by FITC-dextran permeability assay (Fig 3). Though the conventional emulsion also showed similar trends, the efficacy was significantly better with nanoemulsion treatment but neither the nanoemulsion nor conventional emulsion caused any significant change in the microbial colonization of the murine gut mucosa. (Fig 4). Mechanistic assessment of the nanoemulsion against inflammation and invasion across the Caco-2 cell monolayer revealed that nanoemulsion treatment protected the expression of Zona occludens-1 along the tight junction, almost by 3-fold as compared to the infected cell monolayer (Fig 5). Such protection was evinced by the trans-epithelial electrical resistance value and the FITC-dextran permeability analysis as well. Fish oil nanoemulsion treatment has also shown a significant reduction in pro-inflammatory cytokine expression by the *Salmonella* strain SL1344 infected Caco-2 cell monolayer. The conventional emulsion also showed distinct protection, but the nanoemulsion offered better protection at the same dosage as fish oil, probably due to its better bioavailability. The results proved that fish oil-loaded nanoemulsion can be efficacious in maintaining the barrier function and protecting against systemic bacteremia during invasive intestinal infection.

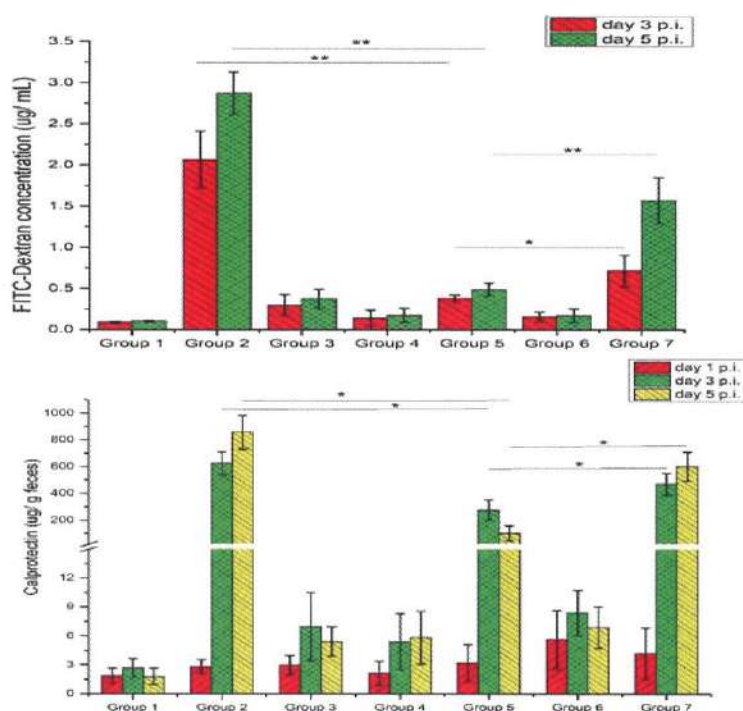


Fig 3: Gut permeability measured by determining the FITC-dextran (MW 4 kDa) concentration in the plasma of BALB/c mice and Faecal calprotectin load (indicator for mucosal inflammation) significant betterment in nanoemulsion treated mice, has shown similar trends. Group 1: PBS Control; Group 2: STm infected (108 CFU);

Group 3: STm infection (108 CFU) + Ofloxacin treatment (50 mg per kg body weight; single dosing on day 1 post-infection); Group 4: NE treatment (25 μ l, i.e. 15 mg fish oil per kg body weight; once every day for 15 day); Group 5: STm infected (108 CFU) + NE treatment (25 μ l, i.e. 15 mg fish oil per kg body weight; once every day for 15 day); Group 6: CE treatment (25 μ l, i.e. 15 mg fish oil per kg body weight; once every day for 15 day); Group 7: STm infected (108 CFU) + CE treatment (25 μ l, i.e. 15 mg fish oil per kg body weight; once every day for 15 days). Data presented as Mean \pm SD (n = 5). * indicate $p < 0.05$; ** indicate $p < 0.01$.

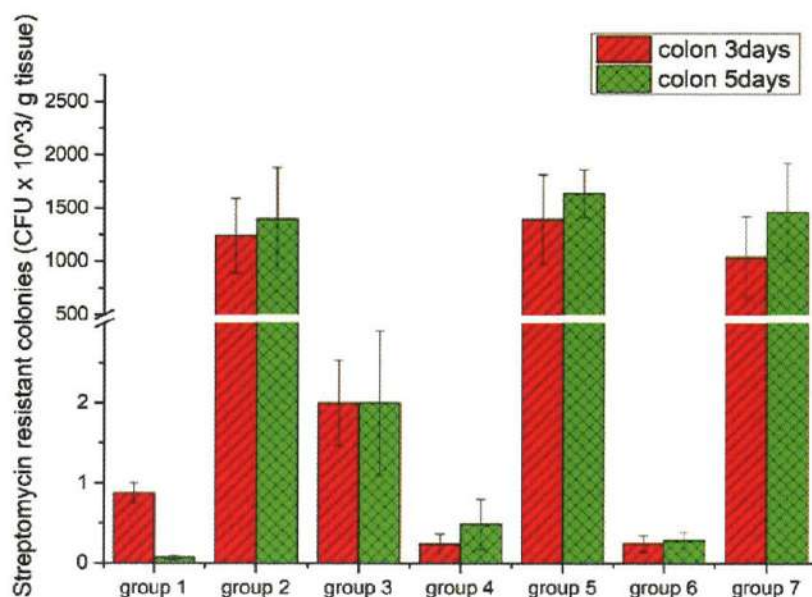


Fig 4: Mucosal colonization of STm strain SL1344 in the BALB/c mice colon didn't show any significant change, an interesting observation while gut permeability and colonic inflammation has shown significant betterment with the nanoemulsion treatment. Group 1: PBS Control; Group 2: STm infected (108 CFU); Group 3: STm infection (108 CFU) + Ofloxacin treatment (50 mg per kg body weight; single dosing on day 1 post-infection); Group 4: NE treatment (25 μ l, i.e. 15 mg fish oil per kg body weight; once every day for 15 day); Group 5: STm infected (108 CFU) + NE treatment (25 μ l, i.e. 15 mg fish oil per kg body weight; once every day for 15 day); Group 6: CE treatment (25 μ l, i.e. 15 mg fish oil per kg body weight; once every day for 15 day); Group 7: STm infected (108 CFU) + CE treatment (25 μ l, i.e. 15 mg fish oil per kg body weight; once every day for 15 days). Data presented as Mean \pm SD (n = 5). * indicate $p < 0.05$; ** indicate $p < 0.01$.

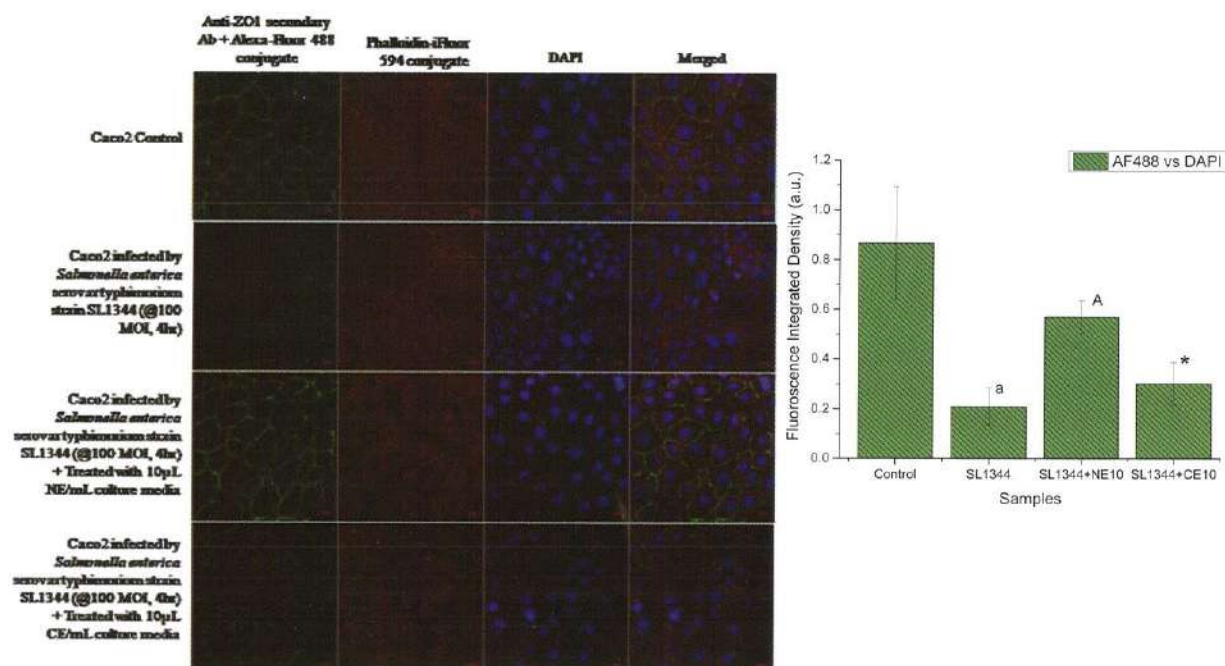


Fig 5: Tight junction protein ZO1 in the Caco2 cell monolayer was deregulated by the infection with STm strain SL1344. The tight junction protein ZO1 of the Caco2 cells had been delocalized from the location by the STm infection, as shown by the alexa-fluor signals, normalized against the DAPI signals. Treatment with NE and CE had unambiguously protected the localization of ZO1. The fluorescence-integrated density of alexa fluor, normalized against the DAPI signals had clearly evinced the advantages of NE compared to CE.

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. The multidrug resistance Enterobacteriaceae causes many serious infections resulting in prolonged hospitalization, increasing treatment cost and mortality rate. In this study, we characterized *bla*_{NDM-5}-positive multidrug resistance commensal *Escherichia coli* (CE) isolated from diarrheal patients in Kolkata, India. Three carbapenem-resistant CE strains (CE88, CE89 and CE93) were isolated from diarrheal stools, which were negative for multiplex PCR assay specific for different pathogroups of diarrheagenic *E. coli* (DEC). The presence of carbapenemases encoding genes and other antimicrobial resistance (AMR) genes were detected using PCR followed by amplicon gene sequencing. Genetic relatedness of the *bla*_{NDM-5} positive CE strains were determined by pulsed-field gel electrophoresis (PFGE), multilocus sequence typing (MLST) and PCR-based replicon typing methods. The transferability of *bla*_{NDM-5} was determined by the conjugation experiment. The genetic arrangements adjoining *bla*_{NDM-5} were also investigated by plasmid whole genome sequencing. Except colistin, the *bla*_{NDM-5}-positive CE strains showed resistant to most of the antibiotics. Higher MICs were detected for ciprofloxacin (>32 mg/L) and imipenem (8 mg/L). Molecular typing revealed that three CE belonged to two different STs (ST 101 and ST 648) but they were clonally 95% similar in the PFGE analysis. Screening for AMR genes revealed that all the three CE harbored *Int-1*, *bla*_{TEM}, *bla*_{CTX-M3}, *bla*_{OXA-1}, *bla*_{OXA-7}, *bla*_{OXA-9}, *tetA*, *strA*, *aadA1*, *aadB*, *sul2*, *floR*, *mph(A)*, and *aac(6')-Ib-cr*. The genes responsible

for other antimicrobial resistance were not detected in this plasmid (Fig 6). In conjugation experiment, the transfer frequencies ranged from 2.5×10^3 to 8.4×10^5 . The *bla*_{NDM-5} gene was found to be situated on a 94-kb plasmid and additional sequence analysis showed that pNDM-TC-CE-89 plasmid was highly similar to IncFII type plasmid harboring an IS26-IS30-*bla*_{NDM-5}-*ble*_{MBL}-*trpF*-*dsbd*-IS91-*dhps* structure (Fig 7). To the best of our knowledge this is the first report on carbapenem resistance involving the *bla*_{NDM-5} gene in CE from diarrheal patients. The circulation of *bla*_{NDM-5} gene in CE is worrisome, since it has potential to transfer this gene to other enteric pathogens.

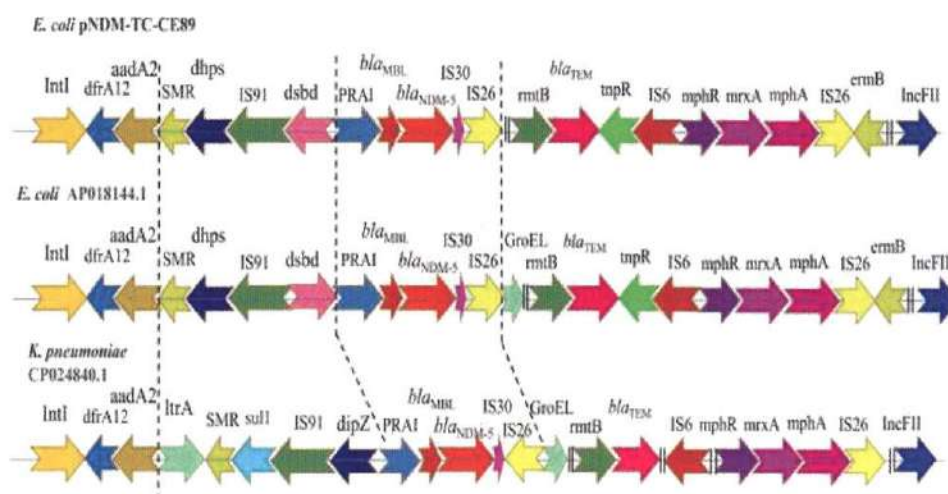


Fig 6: Schematic representation and comparison of the sequences of different antimicrobial resistance encoding genes and their association with mobile genetic elements of *E. coli* (accession no. AP018144.1), *K. pneumoniae* (accession no. CP024840.1) and commensal *E. coli* (CE-89) strains harboring *bla*_{NDM-5}. Arrow lengths are proportionate to the lengths of the genes or open reading frames. Genetic structure of CE NDM isolates was identified the link between resistance genes and mobile genetic element. *trpF*: phosphoribosylanthranilate isomerase gene; *IS26*: *IS26* transposase; *IntI1*: class 1 integron integrase *IntI1*; *dfrA12*: dihydrofolate reductase; *aadA2*: aminoglycoside resistance protein; *SMR*: quaternary ammonium compound efflux *SMR* transporter *QacE* delta 1; *Dhps*: dihydropteroate synthase; *IS91*: *IS91* family transposase; *DsbD*: Thiols:disulfide interchange protein *DsbD*; *PRAI*: phosphoribosylanthranilate isomerase; *ble*_{MBL}: bleomycin resistance protein; *bla*_{NDM5}: subclass B1 metallo- β -lactamase NDM-5; *IS30*: Transposase-like protein, *IS30* family; *bla*_{TEM}: β -lactamase; *tnpR*: Transposon *Tn3* resolvase, *mphA*: macrolide 2'-phosphotransferase.

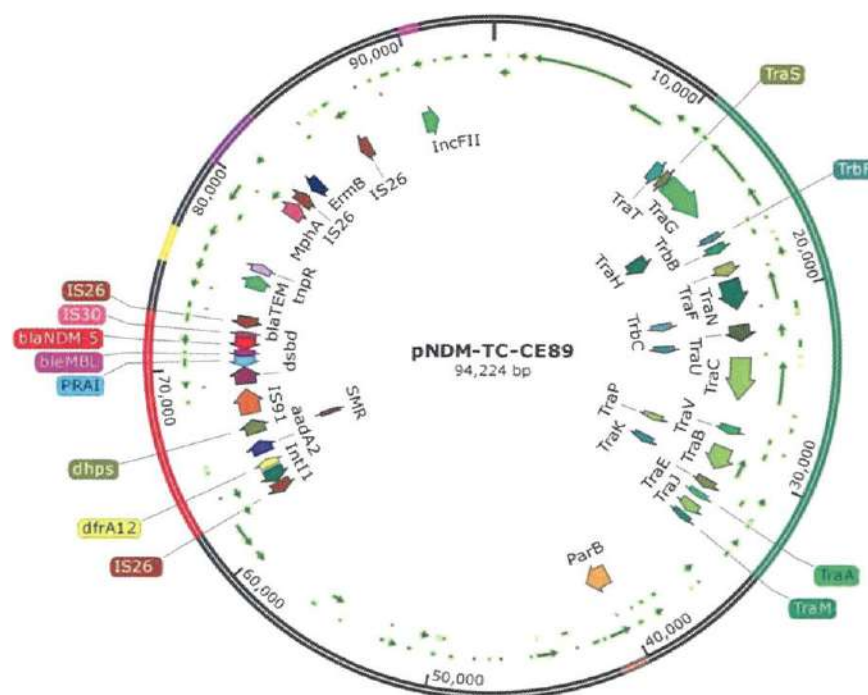


Fig 7: Salient features of *bla*_{NDM-5} encoding plasmid pNDM-CE-89 plasmid with other resistance genes, transposons and type IV conjugative transfer system. The circle in red colour indicates the flanking structure of *bla*_{NDM-5}. Transfer machinery are showed in green colour. Cloned par loci genes are indicated in yellow colour and the transposons IS26 elements are marked in brown

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

- Dr Mukhopadhyay has successfully completed the online training on “Code of Conduct for Government Employees” organized by Institute of Secretariat Training and Management on 27th March 2023.
- Dr Mukhopadhyay has successfully completed the online training on “Prevention of Sexual Harassment of Women at workplace” organized by Institute of Secretariat Training and Management on 20 March 2023.
- A one day training and workshop was arranged for final year medical students from BHMS from homeopathy college. 85 students participated in this program. Faculties from NICED have taken theory and practical classes as well as lab visits were also arranged. Dr. Mukhopadhyay was associated as a faculty member in this training programme on bacteriological aspects.
- Dr Mukhopadhyay attended the 5th meeting of Water Purification Systems Sectional Committee, FAD 30 held on 8th February 2023 through WebEx organized by the Bureau of Indian Standards and this meeting was chaired by Dr. Pawan Kumar Labhasetwar, Chief Scientist & Head Water Technology and Management Division CSIR-National Environmental Engineering Research Institute (NEERI), Nagpur.
- Dr Mukhopadhyay participated in the 16th Asian Conference on Diarrhoeal Diseases and Nutrition ASCODD 2022 organized by ICMR-NICED, Kolkata during November 11-13, 2022 and delivered a talk on “Exploring Herbal treatment for Helicobacter pylori infection to combat Increasing Antibiotic Resistance”.

PhD Awarded

Name of the student : Dr. Prosenjit Samanta received Ph. D. degree on 03/08/2022.

Title of the Thesis : Molecular characterization of newer variant *Vibrio cholerae* O1 strains in India with reference to antimicrobial susceptibility to elucidate their role in higher virulence.

University : Jadavpur University

Date of Degree : 03/08/2022

Post and Pre-Doctoral Fellows:*Post-Doctoral Fellows:*

Dr. Gautam Chowdhury, PDF-OUP

Pre-Doctoral Fellows:

Mr. Bipul Chandra Karmakar, SRF-DST INSPIRE (Till Aug 2019); RA(Since Sept 2019)

Mr. Prosenjit Samanta, SRF-CSIR

Ms. Sangita Paul, SRF- CSIR

Ms. Debjani Ghosh, SRF-CSIR

Ms. Sreeja Shaw, SRF-CSIR

Ms. Deboleena Roy, JRF

Mr. Nirupam Roy, JRF

S. Basu (Principal Investigator), Bacteriology Division

Emergence of NDM-1-producing hypervirulent *Klebsiella pneumoniae* (hvKP) causing neonatal infections

Occurrence of hypervirulent *K. pneumoniae* (hvKP) in the clinical setups pose a great threat because of its ability to cause invasive disease not seen in classical *K. pneumoniae*. This study characterizes neonatal septicaemic hvKP/carbapenem resistant –hvKP (CR-hvKP) strains in terms of resistance and virulence over an extended period of time.

During the study period, 29 hvKP strains were detected from blood, of which, 9 CR-hvKP strains were detected as carbapenem-resistant, MICs ranging from 8 to 64 mg/L, and carried different resistance and virulence determinants. They belonged to different STs (ST11, ST14, ST15, ST65, ST268, and ST307) and hypervirulence-associated capsular types (K2, K20, and K54). Two variants of *bla*_{NDM} were detected, *bla*_{NDM-1} and *bla*_{NDM-5}. One strain co-harboured *bla*_{OXA-232}. These CR-hvKPs displayed strong biofilm-forming capability and were resistant to normal human serum. *bla*_{NDM} was present on conjugative plasmids with diverse replicon types (IncA/C, IncR, IncFII, IncFIIK, and IncHIB-M/FIB-M).

WGS of two NDM-1-producing CR-hvKPs revealed presence of pLVPK-associated markers. They carried a collection of different AMR determinants, heavy-metal resistance determinants, efflux pumps and regulator elements, along with different plasmid replicons and belong to ST15-K54 and ST11-K2, respectively. They were highly virulent, and possessed various putative virulence factors. K-associated hypervirulent molecular markers (*rmpA*, *rmpA2*, *iroBCDEN*, *iucABCDiutA*, and *peg-344*) were also noted in these two genomes. These strains showed ~94% of inter-genomic resemblance with other global hvKP reference genomes.

One strain belonging to ST11-K2 harbored a large (~210kbp), conjugative, multi-replicon (IncHIB/IncFIB) transmissible hybrid plasmid, designated as pvirEN5289, possessing both virulence (*rmpA2*, *iroB*, *iroN*, *iucABCDiutA*, and *peg-344*) and resistance markers (*bla*_{NDM-1} and *bla*_{CTX-M-15}). Transmissible hybrid plasmid similarities when aligned against global hypervirulent plasmids showed significant similarities (Fig 8). Occurrence of transmissible carbapenem-resistant gene, *bla*_{NDM}, along with virulence associated markers calls for vigilance, as most clinical microbiology laboratories do not test for them.

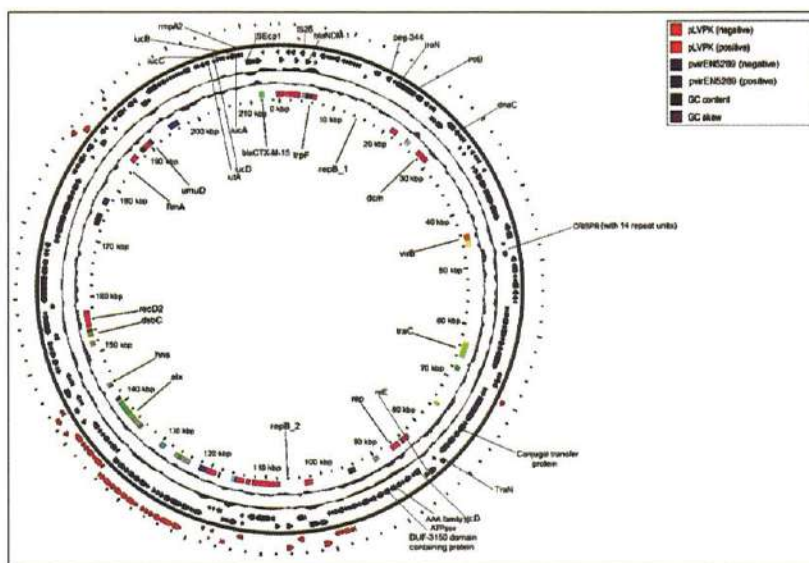


Fig 8: Sequence alignment of hybrid plasmids (having both resistance and virulence markers) with global hypervirulent plasmids.

High-risk clones of extraintestinal pathogenic *Escherichia coli* (ExPEC) causing neonatal infection over a decade

Escherichia coli can cause life threatening infections like sepsis in neonates and are often associated with a high burden of antimicrobial resistance. This study characterized *E. coli* isolates causing neonatal sepsis over a period of 10-years (2009-2019).

Eighty *E. coli* collected from blood and other sources were analyzed. They were multidrug-resistant and susceptible to colistin and tigecycline only. Major carbapenemase was *bla*_{NDM} (44%) along with other resistance determinants (*bla*_{CTX-M}, *bla*_{TEM}, *bla*_{SHV}, *bla*_{OXA-1}, *rmtB*, *armA*, *qnrB*, *qmrS*, *oqxA*, *oqxB*, *aac-6'-Ib-cr*, *aac-6'-Ib*). NDM-1 was the only variant till 2014, but after 2014 it was subsequently replaced by other NDM-variants (NDM-5 and NDM-7). All *bla*_{NDM} were conjugative and were present on different replicon types (IncF, FII, FIIK, X3, A/C, FIA, FIB, Ily etc.). Upstream and downstream regions of *bla*_{NDM} showed the presence of a full or truncated *ISAbal25* and *ble*_{MBL} respectively.

Variants of *bla*_{NDM} possessed different serotypes: O53:H18, O25:H9, O8:H9, O78:H18 (*bla*_{NDM-1}), O101:H9, O101:H5, O101:H33 (*bla*_{NDM-5}); and O101:H9, O30:H8, O4:H8 (*bla*_{NDM-7}). Six variants of Type 1 fimbriae D-mannose specific adhesin (*fimH*) were distributed in *bla*_{NDM}-possessing isolates with different virulence factors (*traT*, *fyuA* and *fimH*).

Isolates mainly belonged to phylogroup B2 (37.5%) followed by A (26.25%). Phylogroup B2 carried highest number of virulence factors. Presence of two epidemic clones: ST167 (Phylogroup A) and ST131 (phylogroup B2) were noted. ST167 and ST131 isolates possessed *bla*_{NDM} along with other resistance determinants. ST131 was found to be highly virulent, ST167 was highly resistant and possessed *bla*_{NDM-5} gene. These clones when compared with other global ST131 & ST167 clones exhibited significant differences in terms of SNPs (Fig 9A & 9B). Global and study ST131 had more differences in SNPs indicating heterogeneity of the clone.

Increasing numbers of carbapenem-resistant high-risk epidemic clones is worrisome which warrant strict surveillance and further research.

Tree scale: 0.001

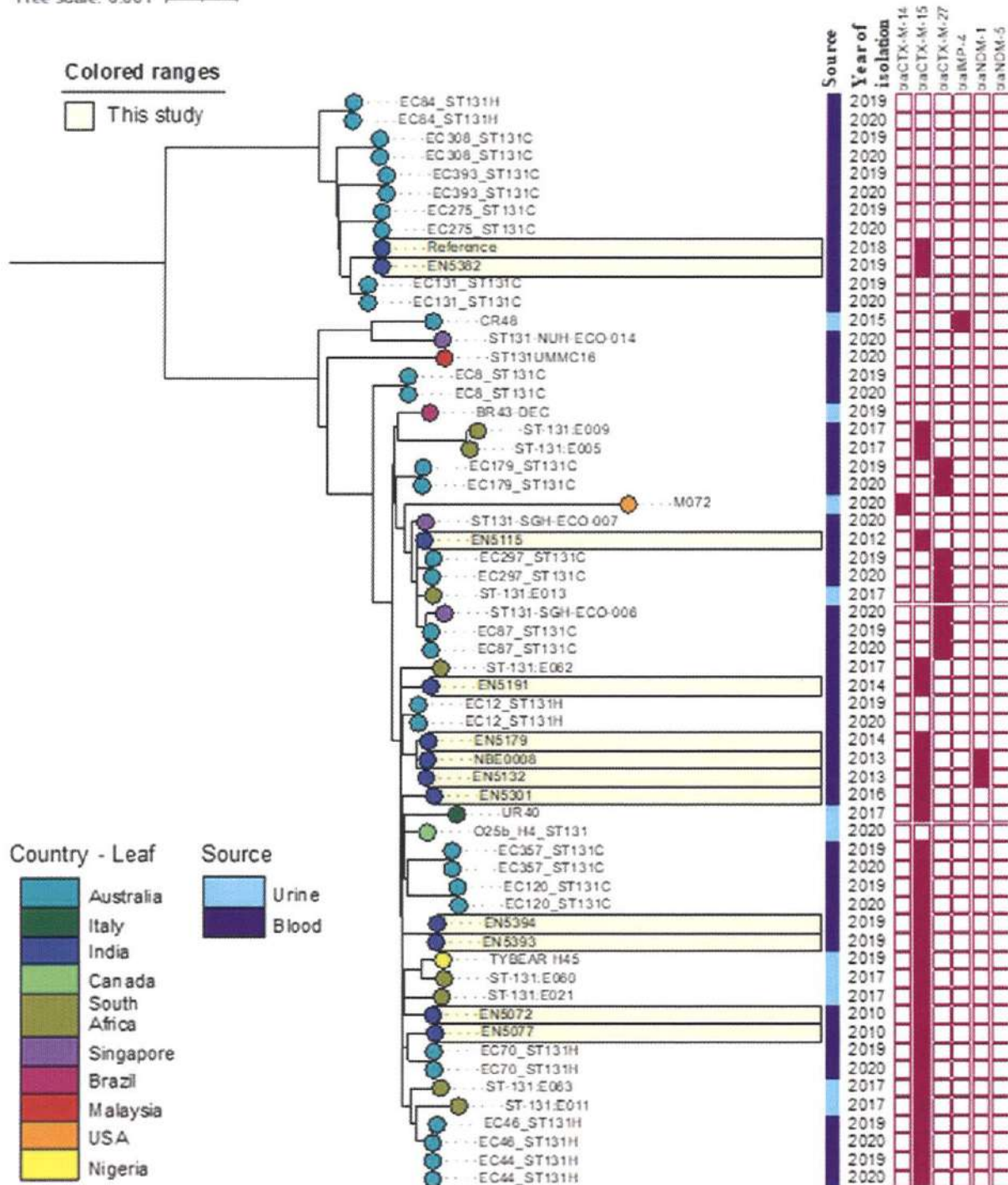


Fig 9A: Single nucleotide polymorphism (SNP)-based phylogeny of ST131 isolates (study & global isolates).

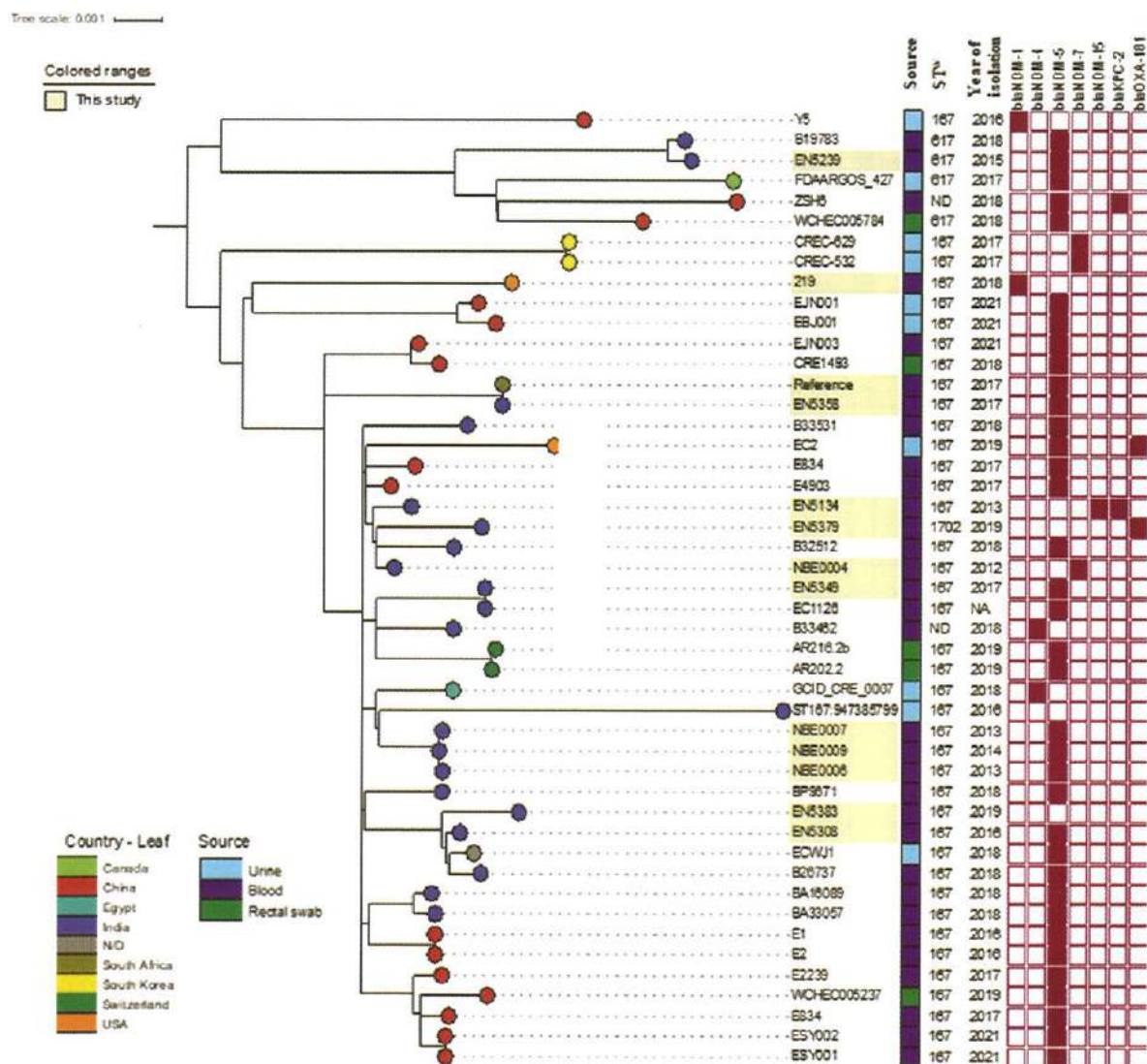


Fig 9B: Single nucleotide polymorphism (SNP)-based phylogeny of ST167 isolates (study & global isolates).

Awards/honours received

- Fellow of the National Academy of Sciences, India (FNASc)

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

- 32nd European Congress of Clinical Microbiology & Infectious Diseases, Lisbon, Portugal, 2022. Carriage of antibiotic-resistant bacteria in maternal and neonatal gut: the *mcr* story. (Online presentation by S. Basu).
- 32nd European Congress of Clinical Microbiology & Infectious Diseases, Lisbon, Portugal, 2022. Characterisation of NDM-15-producing *Escherichia coli* ST167 causing neonatal sepsis. (online presentation by Shravani Mitra)
- 16th Asian Conference on Diarrhoeal Disease and Nutrition (ASCODD). 11th-13th November, Kolkata, India. 2022. Carbapenem-resistant hypervirulent *Klebsiella pneumoniae* causing neonatal sepsis: more than meets the eye (Talk).
- 16th Asian Conference on Diarrhoeal Disease and Nutrition (ASCODD). 11th-13th November, Kolkata, India. 2022. Novel mutations (Gly186Val, Ser188Phe, Glu121Lys, Val255Ile) within two-

component regulator AdeRS of AdeABC efflux pump lead to carbapenem resistance among *Acinetobacter baumannii*. (Presented by Dr. Subhasree Roy)

- 16th Asian Conference on Diarrhoeal Disease and Nutrition (ASCODD). 11th-13th November, Kolkata, India. 2022. Plasmid-mediated AmpC (pAmpC) in *Escherichia coli* from Septicaemic Neonates – An Analysis of their Transmission and Phenotypic Detection. (Presented by Ankur Rao)
- 16th Asian Conference on Diarrhoeal Disease and Nutrition (ASCODD). 11th-13th November, Kolkata, India. 2022. Characterization of two major epidemic clones ST131 and ST167 of *Escherichia coli* causing neonatal infection; focusing on antibiotic resistance and virulence over a decade. (Presented by Amrita Bhattacharjee).
- 16th Asian Conference on Diarrhoeal Disease and Nutrition (ASCODD). 11th-13th November, Kolkata, India. 2022. Dissemination of NDM-variants in maternal and neonatal gut. (Presented by Priyanka Basak).
- 91st Annual Meeting of the Society of Biological Chemists (India), Kolkata, 8-11th December, 2022. Time to be HYPER about hypervirulent *Klebsiella pneumoniae*. (Invited talk)
- 91st Annual Meeting of the Society of Biological Chemists (India) Kolkata, 8-11th December, 2022. Associating beta-lactam resistance with CRISPR-Cas systems - a study in *Klebsiella pneumoniae*. (Presented by Ankur Rao).
- 91st Annual Meeting of the Society of Biological Chemists (India) Kolkata, 8-11th December, 2022. The genetic context of NDM-variants and its spread via mobile genetic elements in *Escherichia coli* present in neonatal gut. (Presented by Priyanka Basak).

Ph.D. Awarded

Name of the student:	Shravani Mitra
Title of the thesis:	Acquired mechanisms of resistance in Enterobacteriaceae: a focus on carbapenem and quinolone resistance
University name:	University of Calcutta
Date of degree:	02.03.2023
Name of the student:	Sharmi Naha
Title of the thesis:	A study on carbapenem & colistin resistance in Enterobacteriaceae causing neonatal sepsis
University name:	University of Calcutta
Date of degree:	28.12.2022

Post and Pre-Doctoral Fellows:

Post-Doctoral Fellow:

Dr. Sharmi Naha- Research Associate-I (ICMR-project)

Pre-Doctoral Fellow:

Ms. Amrita Bhattacharya, SRF-ICMR

Mr. Ankur Rao, SRF

Ms. Tanusree Das, SRF

Ms. Priyanka Basak, JRF-ICMR

Ms. Deblina Nath, JRF

Mr. Sanjib Das, JRF

H. Koley (Principal Investigator), Bacteriology Division

•Development of a vaccine against *Helicobacter pylori* based on immunogen formulated from circulating prevalent strains

Helicobacter pylori (*H. pylori*) is a gram negative, microaerophilic bacteria that causes gastric ailments in human. The circulating strains of *H. pylori* cause chronic gastritis which eventually leads to diseases like gastric ulcers, duodenal ulcers, dyspepsia, gastric adenocarcinoma or gastric cancer, mucosal associated lymphoid tissue (MALT) lymphoma globally (Polk et al., 2010). The pathogen poses occasional threats in many developed nations and remains a constant burden in developing countries. As infected individuals can remain asymptomatic for a lifetime with occasional shedding; without any effective strategy the disease can spread easily to a larger community living in unhygienic condition and in very close proximity like slums (Ahmed et al., 2007). Due to lack of a licensed vaccine, currently a combination of antimicrobial drugs is in use which is increasing multidrug resistance varieties of the pathogen (Khien et al., 2019). Inefficient conventional approaches don't provide any permanent and long-lasting immunity which is why this study aims to apply multi-dimensional approaches in order to develop a vaccine. Recent studies on different platforms as a vaccine delivery system have shown promising results (Lubitz et al., 2009). Thus we want to assess the efficacy of immunogen isolated from circulating strains of *H. pylori* in detail. Previously described animal model for *H. pylori* study along with intra-peritoneal or oral immunization with immunogen can help us to understand the efficacy in generating an immune response. (Chen et al., 2020).

Polymerase chain reaction of isolated strains were performed to characterize them genotypically. For simplex (*ureB*) and multiplex (*cagA*, *vacA*) PCR, DNA was isolated following Phenol-chloroform-isoamylalcohol method. The concentrated DNA was diluted 30fold, and 4 µl was added in 25 µl volumes containing 2.5 pmol of primers VAG-F and VAG-R, 25 pmol of primers VA1-F and VA1-R, 10 pmol of primers cag5c-F and cag3c-R, 0.25 mM of each deoxynucleoside triphosphate, 0.9 U of *Taq* DNA polymerase (Takara, Shuzo, Japan), and 1.5 mM of MgCl₂ in standard PCR buffer (Takara). Products were amplified under the following conditions: 3 min at 94°C for initial denaturation followed by 35 cycles of 1 min at 94°C, 1 min at 55°C, and 1 min at 72°C, with a final round of 10 min at 72°C, in a thermal cycler. The amplified bands were visualized under trans-UV. (Fig. 10a,b)

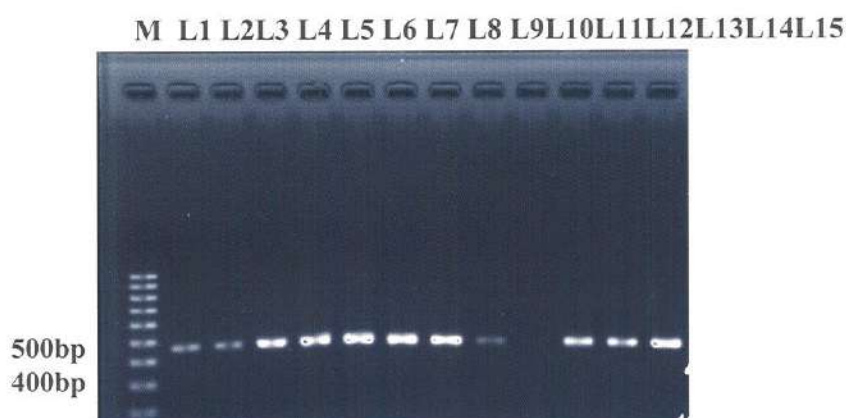


Fig 10:
a. Simplex PCR for *UreB* subunit of Urease enzyme, a typical confirmatory PCR based method for *H. pylori*.

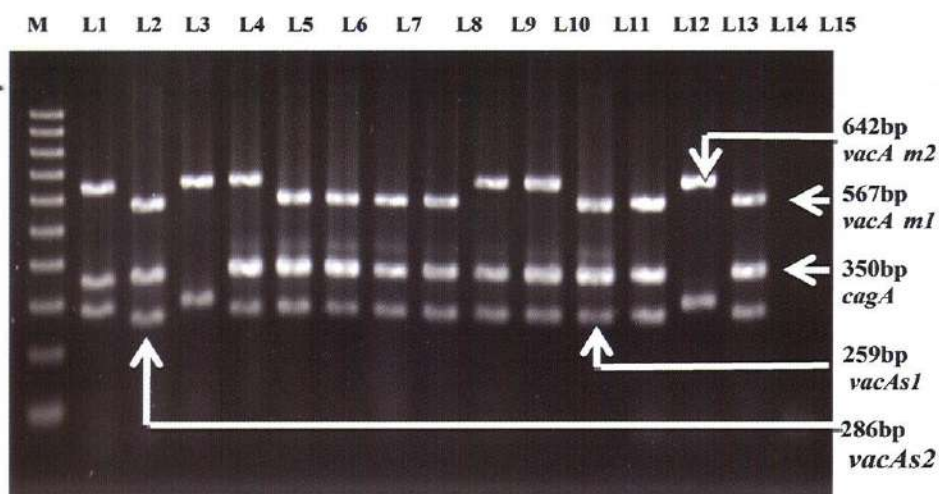


Fig 10b. Genotypic characterization using Multiplex PCR method (Chattopadhyay et al, 2004), L1-*slm1cag*+26695, L2-*s2m2cag*-D383, L3-*slm2cag*+B6, L4-*slm2cag*+M28, L5-*slm1cag*+KO8A, L6-*slm1cag*+AS2, L7-*slm1cag*+OT10A, L8-*slm1cag*+B34, L9-*slm2cag*+BHU8A, L10-*slm1cag*+L7, L11-*slm1cag*+A61C(1)

Transmission electron microscopic (TEM) analysis of OMVs revealed the morphology of immunogen strain. The lipid bilayer vesicles can be clearly distinguished from TEM analysis (Fig. 11).

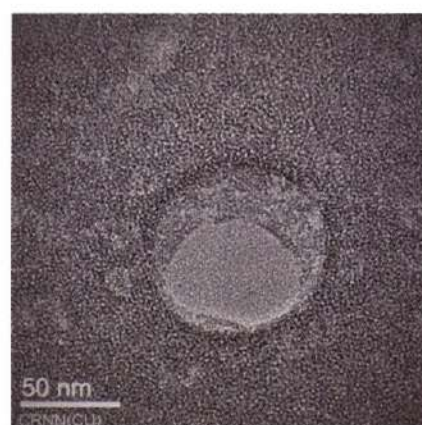
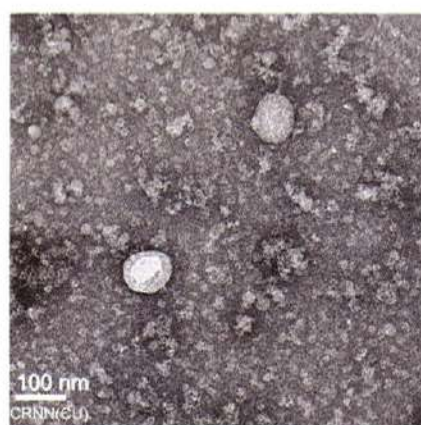


Fig 11: Outer Membrane Vesicles (OMVs) from immunogen strain under transmission electron micrographs. The scale bar represents 100nm and 50nm respectively.

DLS analysis of OMVs revealed that different clinical isolates of *H. pylori* strain characteristically secrete homogenous sizes of OMVs. The average diameter of immunogen OMVs was found to be 117.9 nm (Fig. 12).

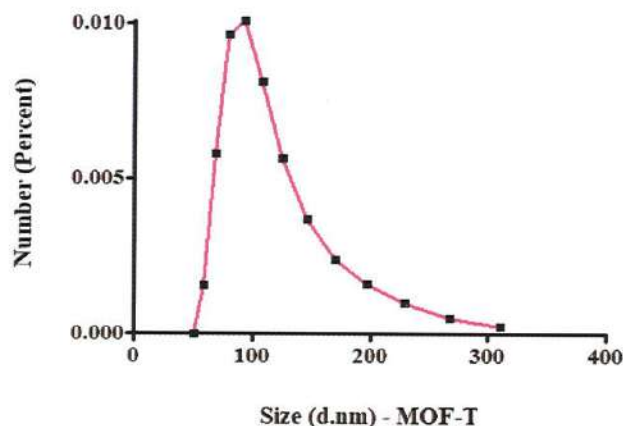


Fig 12: Dynamic Light Scattering or DLS assay representing a single peak depicting the homogeneity.

Patent(s) filed/accepted /Technology developed

1. "A bivalent typhoidal bacterial ghost (BTBG) immunogenic formulation and method for preparation thereof", the complete patent application of this invention has been filed on June 15, 2022 and the patent application number is 202211034380.
2. "A novel Trivalent Iron Nanoparticles Electroporated Outer Membrane vesicles-based antigen (TINEOMVs) as a vaccine candidate against *Campylobacter Jejuni*, *Salmonella* Typhimurium and *Salmonella* Enteritidis" the complete patent application of this invention has been applied to the IPR department of ICMR (HQ), New Delhi.

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

- "Resource Person" (Speaker) at 16th Asian Conference on Diarrhoeal Disease and Nutrition (ASCODD 2022) due to be held on 11-13 November, 2022, at Kolkata, Title of the Session: Food borne Diseases: Prevention and Control.
- "Sri Ramendra Sundar Sinha Memorial Oration" (2022), The XXXIIIrd Annual Conference of The Physiological Society of India will be held during 3 to 5th March, 2023 at Vidyasagar University.
- "Key Note Speaker" at 1st International Conference on "Drug Discovery and Development for Infectious Diseases: Cutting edge Research and challenges" 3rd and 4th March, 2023. Organized by Eminent College of Pharmaceutical Technology, in association with Bioequivalence study Centre, Jadavpur University.

PhD Awarded:

Name: Suhrid Maiti
 Thesis Title: Development of a novel outer membrane vesicle (OMVs) based immunogen against non-typhoidal *Salmonella* (NTS) mediated gastroenteritis
 University: Jadavpur University
 Date of Degree: 11/05/2022

Name : Ushasi Bhaumik
 Thesis Title : Modulation of host immune responses by Outer Membrane Vesicles-based candidate vaccine against *Shigella* with a focus on limited antigen administration resulting broad cross-protection
 University: Jadavpur University
 Date of Degree: 13/06/2022

Pre and Post Doctoral Fellows*Pre-Doctoral Fellow:*

Mr. Prolay Halder, SRF-ICMR
 Mr. Soumalya Banerjee, SRF- UGC
 Mr. Sanjib Das, SRF- UGC

S. Bhattacharya (Principal Investigator), Biochemistry Division

Role of HMGB1 in *H. pylori* infection: A possible therapeutic candidate

Helicobacter pylori is a key agent for causing gastric complications linked with gastric disorders. In response to infection, host cells stimulate autophagy to maintain cellular homeostasis. However, *H. pylori* have evolved the ability to usurp the host's autophagic machinery. High mobility group box1 (HMGB1), an alarmin molecule is a regulator of autophagy and its expression is augmented during infection and gastric cancer. Therefore, this study aimed to explore the role of glycyrrhizin (a known inhibitor of HMGB1) in autophagy during *H. pylori* infection. Here, for the first time the team showed that the autophagy-lysosomal pathway was impaired due to an increase in lysosomal membrane permeabilization during *H. pylori* infection in AGS cells. Subsequently, glycyrrhizin, an inhibitor of HMGB1 restored the lysosomal membrane integrity (Fig 13).

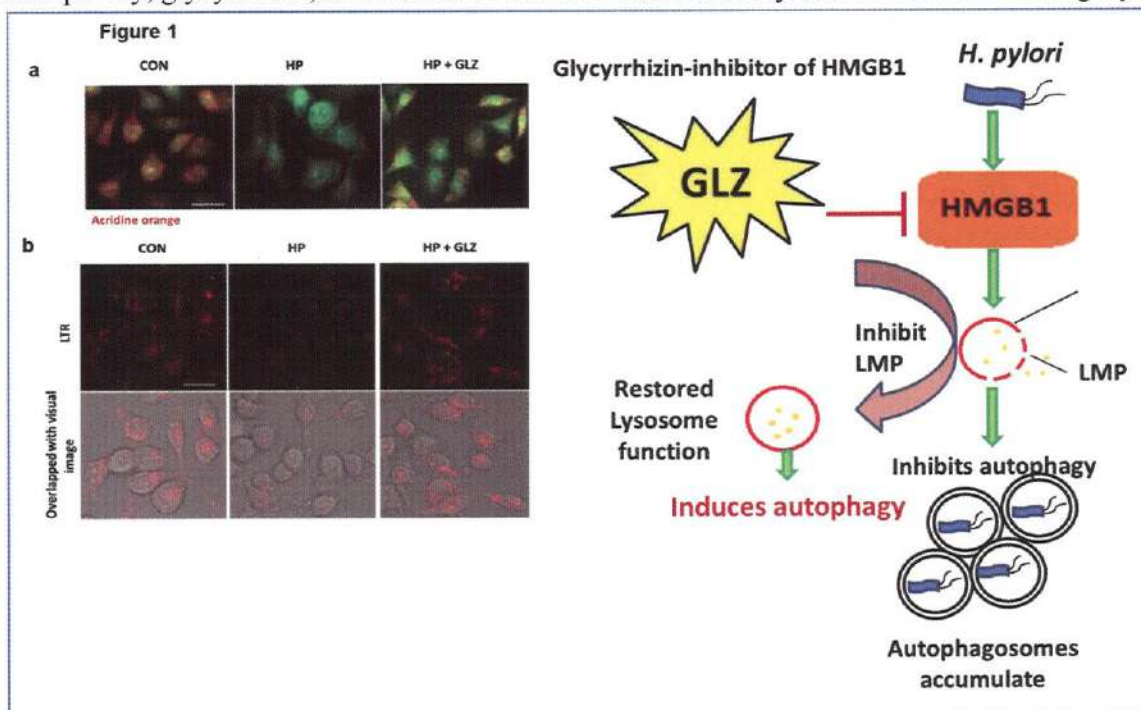


Fig 13: Lysosomal function is restored by glycyrrhizin by inhibiting HMGB1. (a) Infected cells (HP) were treated with glycyrrhizin (GLZ). Lysosomal membrane integrity was monitored by Acridine Orange (AO) staining in a fluorescence microscope. Scale bar: 10 μ m. (b) Live cell imaging of drug-treated (HP+GLZ), infected (HP) and control cells was done with LysoTracker Red incubation (100 nM, 30 min) to label lysosomes and mean fluorescence intensity was assessed under the confocal microscope.

The recovered lysosomal function enhanced autolysosome formation and concomitantly attenuated the intracellular *H. pylori* growth by eliminating the pathogenic niche (Fig 14).

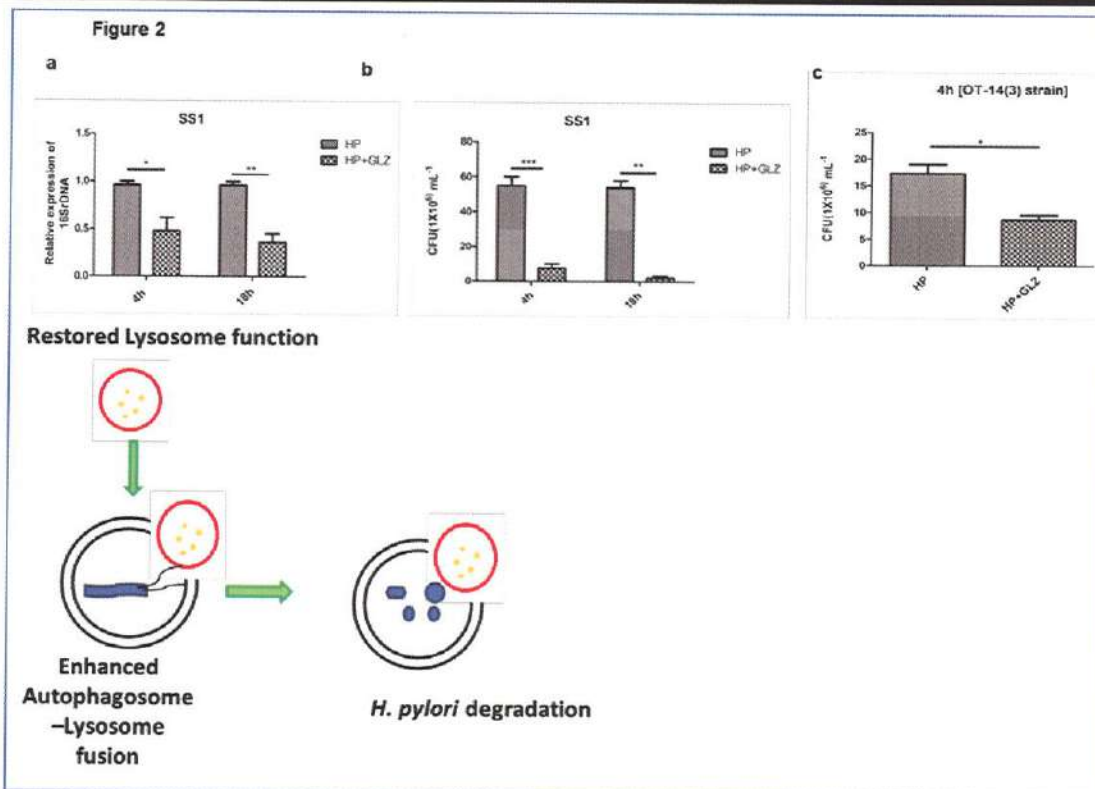


Fig 14. Intracellular *H. pylori* infection was inhibited by glycyrrhizin (a) Intracellular *H. pylori* DNA (16S rDNA) was determined by real-time PCR. (b) glycyrrhizin reduced CFU count of intracellular *H. pylori* (c) Infection with *H. pylori* resistant strain was performed in gastric cells followed by glycyrrhizin GLZ (200 μM) treatment and CFU/ml was graphically represented

Additionally, glycyrrhizin treatment inhibited inflammation and improved gastric tissue damage in mice (Fig 15).

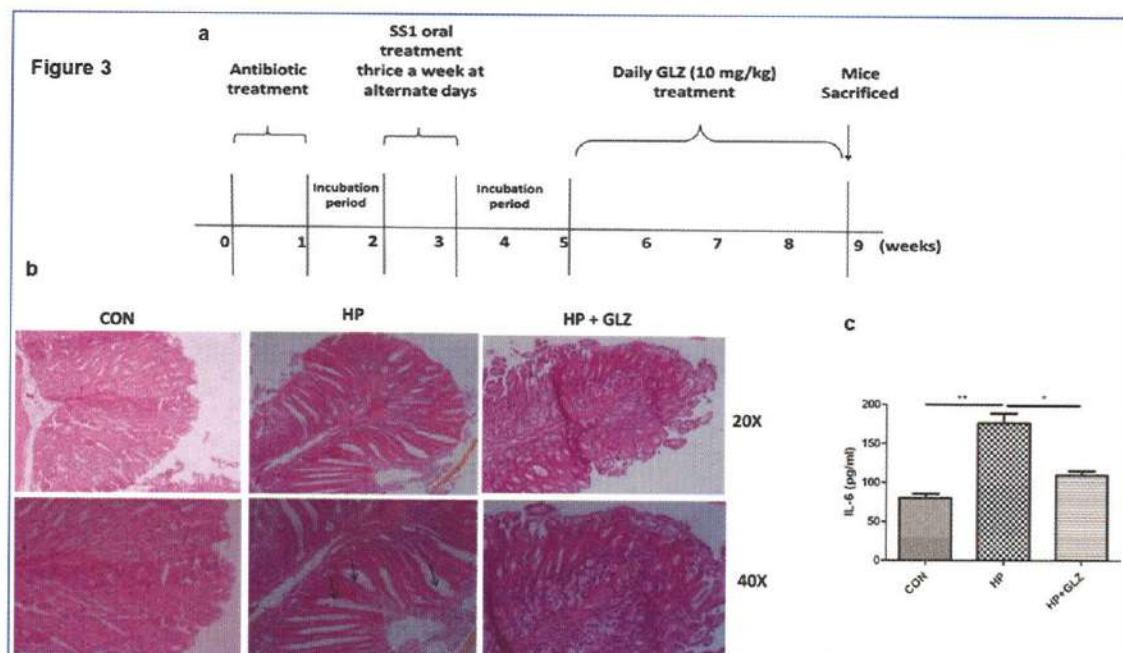


Fig 15: Glycyrrhizin reduced gastric tissue damages (a) Protocol for *H. pylori* infection and glycyrrhizin treatment in C57BL/6 mice (b) Histology images of Control (CON), *H. pylori* (HP) infected, and *H. pylori*-infected plus glycyrrhizin treated (HP+GLZ) gastric tissues at 20X and 40X respectively representing the inflammatory changes. Black arrows () indicate gastric tissue damages (c). The expression of inflammatory cytokine IL-6 was determined by ELISA in a microplate reader.

Overall the study showed that inhibiting HMGB1 restored lysosomal activity to ameliorate *H pylori* infection. It also demonstrated the potential of glycyrrhizin as an antibacterial agent to address the problem of antimicrobial resistance.

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

- 16th Asian Conference on Diarrhoeal Disease and Nutrition, 11-13th November 2022,, ICMR-NICED
- 22nd Congress of the International Society for Ethnopharmacology (Switzerland) and the 10th Congress of Society for Ethnopharmacology (India) is being organized at Imphal, Manipur, India during February 24-26, 2023
- Participated as Resource Person in 6-days AYUSH sponsored residential training programme on "Quality Control and Standardization of Herbal Drugs" at CARI, Kolkata on 03.03.2023

Post and Pre-Doctoral Fellow:

Pre-Doctoral Fellow:

Ms. Priyanka Basak, SRF-DBT

Ms. Uzma Khan, SRF-CSIR

Ms. Priyanka Moitra, SRF-CSIR

Ms. Sushmita Kundu, SRF-UGC

Mr. Sourin Alu, JRF-DHR Project

Mr. Abhishek Singh, JRF-DBT Project

S. Basak (Principal Investigator), Bioinformatics Division

Multomics data analysis revealed crucial host factors for dengue infection.

The advancement of sequencing technology enabled large number of omics data accessible in the public data repositories for dengue virus. Analysis of RNA-seq data facilitated the understanding of the transcriptional changes in Dengue infected and uninfected individual through transcriptome analysis. Identification of differentially expressed genes (DEGs) were performed through the computational analysis of raw RNA-seq host transcriptomic data for all four serotypes of Dengue virus. Enrichment analysis of the differentially expressed genes revealed the roles of these DEGs in viral infection, as well as the key biological pathways in which they are involved. Pathway enrichment analysis was done on the identified DEGs to discover common pathways among the four Dengue serotypes. Identified common pathways were found to be related with the immunological process and correlated with the Dengue infection.

Protein-protein interaction (PPI) network analysis was performed to identify the key genes and the common miRNAs that have the ability to interact with those key genes. The crucial interaction in gene expression of the Dengue virus highlights the possible role to regulate host gene expression. Based on the measured parameters fourteen genes were considered as the important nodes of the PPI network. Among them one gene found as common for all serotypes. Gene ontology study exhibited the influence of these genes towards dengue virus infection. Thus, these genes can be used as potential target for Dengue infection. Screening of miRNAs associated with these DEGs was also done as these miRNAs are the key regulatory factor and involved in many biological processes. These miRNAs may be used as therapeutic targets or a biomarker for dengue pathogenesis. This study has substantial implications for the pathogenesis and targeted treatment of Dengue infection.

Emerging diversity in SARS-CoV2 spike proteins and their interaction with host ACE2 receptor.

This study compared the amino acid usage patterns of spike proteins of five variants of concern, namely Alpha, Beta, Gamma, Delta and Omicron. Distinct amino acid usage pattern of Omicron from other variants have been observed. The selection pressure on the evolution of spike genes in Omicron is expected to affect the distinct amino acid usage pattern. Differential selection pressure was observed among the variants. The accelerated evolutionary rate can be explained by the crucial role of the spike protein, which contributes in host-specific recognition and went through a number of significant modifications during virus infection. Frequent changes through recombination was also detected in the spike protein. The increased recombination event in the omicron has led to changes in the binding affinity between Receptor Binding Domain (RBD) region of spike protein and the human receptor ACE2. Mutation rate analysis suggested significant increase of mutation rate from delta to omicron variant. Omicron variants has much higher mutation rate among the other SARS-CoV2 variants which characterizes the viral adaptability through better binding of spike protein to human receptor, thus increasing its infectivity.

Distinct evolution of toll-like receptor 9 (TLR9) in mammals

Toll-Like Receptors (TLRs) are considered as the primary sensors of invading microbial pathogen in the innate immune system. Thirteen members of the TLR family have been identified in human (TLR1-TLR10) and mouse (TLR1-TLR13). They respond to a variety of pathogen-associated molecular patterns (PAMPs) in humans, including lipopolysaccharide, lipopeptides, bacterial flagellin, viral dsRNA, viral or bacterial ssRNA, and CpG-rich unmethylated DNA. TLR9 is an endosomal receptor that detects bacterial DNA/CpG-containing oligodeoxynucleotides. Differential amino acid usage pattern with completely distinct cluster of TLR9 was observed among the mammalian TLRs. Significant difference of hydrophobicity, GC-content and evolutionary parameters was observed between TLR9 and other TLRs. An ancestral reconstruction

phylogenetic tree was prepared to better understand the observed pattern of TLR9. The ancestral sequence reconstruction analysis revealed that incorporation of changes in the TLR9 began from the ancestral lineages and gradual accumulation of changes over time lead to the distinct pattern of TLR9.

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

- Presented a Poster on “Omicron variant genome evolution” in ASCODD 2022 organised by ICMR-NICED during November 11-13, 2022 at Kolkata.

Post and Pre-Doctoral Fellows:

Pre-Doctoral Fellow:

Ms. Manisha Ghosh, SRF-ICMR

M. Dutta (Principal Investigator), Electron Microscopy

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

Myoviridae family phage utilizes their tail fibers and baseplate components to transfer their genome through the tail tip into the host cytoplasm which is similar to the working principle of a micro syringe. But initial attachment to the host cell, conformational changes in tail components, membrane puncturing, and genome delivery process remain poorly understood areas of phage biology. High-resolution cryo-electron microscopy (cryo-EM) has emerged as a fundamental structural technique to study proteins, viruses, and dynamic cellular processes in unprecedented detail. The main hypothesis of this project is an extensive structural change in the phage tail components during an infection process that will unfold the mechanism of long-tailed phage-host bacteria interaction. In this study, a well-characterized long-tailed *Shigella* phage Sfk20 was selected to study the structural rearrangement during its infection process. Bacterial samples were infected with phage for a brief period and the whole thing centrifuged and free phages were removed and infected cells were fixed to lock the infection process at different time points especially the attachment stage. The fixed samples were then prepared for imaging at cryo condition using plunge freezing and 2D images were taken from several areas of cryo grids. One sample showed phages attached to the whole bacteria (Fig. 16).

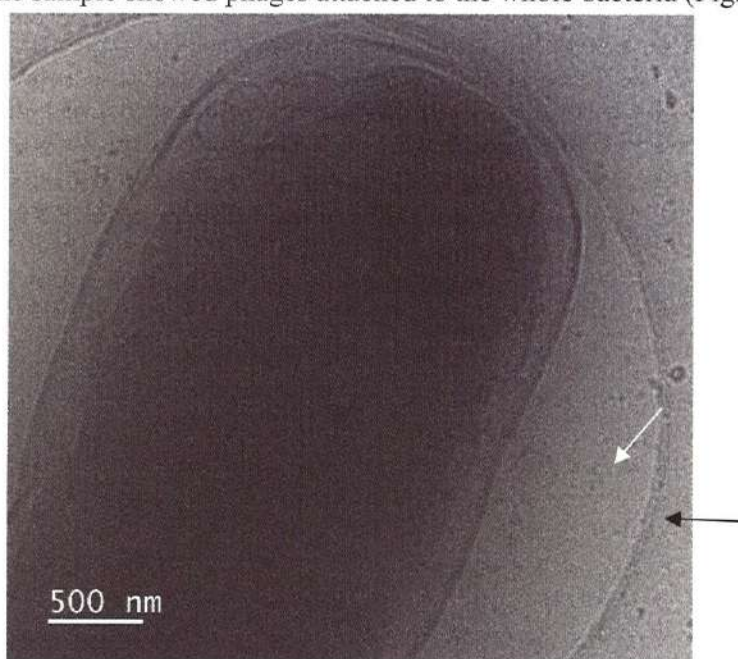


Fig. 16: The Sfk20 phage attached to host cell with the tail in contracted position (white arrow) and the DNA from empty head (black arrow) has been transferred inside host cell.

Characterization of a novel broad-spectrum *Salmonella* phage isolated from environmental source and evaluating its efficacy for the treatment of *Salmonella* infections

Salmonella is one of the common causal agents of bacterial gastroenteritis-related morbidity and mortality among children below 5 years and the elderly population. Salmonellosis in humans is caused mainly by consuming contaminated food originating from animals. The genus *Salmonella* has several serovars, and many of them are recently reported to be resistant to multiple drugs. Therefore, the isolation of lytic *Salmonella* bacteriophages in search of bactericidal activity has received importance. In this study, a *Salmonella* phage STWB21 was isolated from a lake water sample and found to be a novel lytic phage with promising potential against the host bacteria *Salmonella typhi*. However, some polyvalence was observed in their broad host range. In addition to *S. typhi*, the phage STWB21 was able to infect *S. paratyphi*, *S. typhimurium*, *S. enteritidis*, and a few other bacterial species such as *Sh. flexneri* 2a, *Sh. flexneri* 3a, and

ETEC. The newly isolated phage STWB21 belongs to the Siphoviridae family with an icosahedral head and a long flexible non-contractile tail. Phage STWB21 is relatively stable under a wide range of pH (4–11) and temperatures (4°C–50°C) for different *Salmonella* serovars. The latent period and burst size of phage STWB21 against *S. typhi* were 25 min and 161 plaque-forming units per cell. Since *Salmonella* is a foodborne pathogen, the phage STWB21 was applied to treat a 24 h biofilm formed in onion under laboratory conditions. A significant reduction was observed in the bacterial population of *S. typhi* biofilm (Fig.17). The genomic analysis confirmed the presence of lytic genes and the absence of any lysogeny or toxin genes. Overall, the present study reveals phage STWB21 has a promising ability to be used as a biocontrol agent of *Salmonella* spp. and proposes its application in food industries.

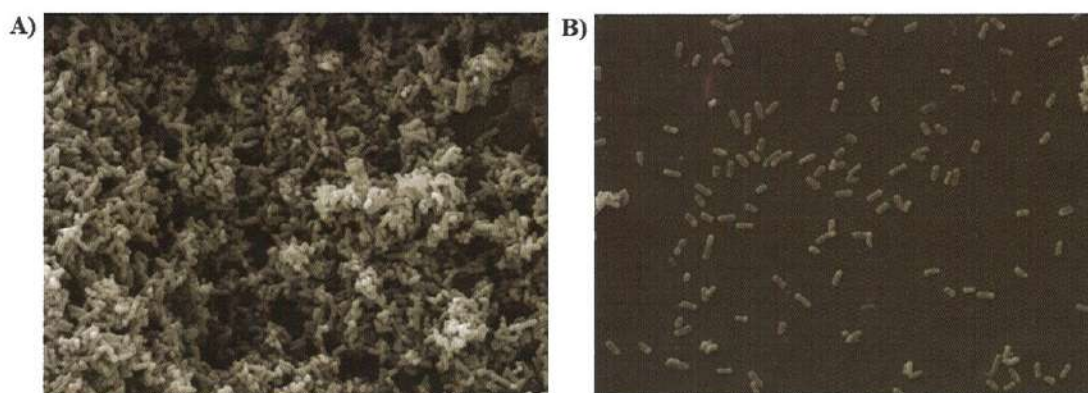


Fig 17. A) Formation of *Salmonella* biofilm on the surface of the onion. B) Reduction of bacterial population in biofilm using phage STWB21.

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

i) Title: National Workshop on Electron Tomography of Biological Specimens

Date: 9th–13th May 2022.

Place: AIIMS, New Delhi

Organizer: Electron Microscope Facility, Department of Anatomy, AIIMS, New Delhi

Status of participation: Invited Speaker/Resource person

No. of attendees: approximately 40

Presentation Title: “Seeing is believing: Multifaceted Application of Cryo-ET in Structural Virology”.

ii) Title: Monthly Talk Series of ICMR-Electron Microscopy Consortium

Date: 2nd June 2022.

Place: Online

Organizer: ICMR-NIV, Pune

Status of participation: Invited Speaker

No. of attendees: approximately 30

Presentation Title: “Cryo-electron Tomography and its multifaceted application in Biomedical Research”.

Post and Pre-Doctoral Fellows:

Pre-Doctoral Fellow:

Ms. Bani Mallick, SRF-UGC

Ms. Payel Mondal, SRF-CSIR

Mr. Aninda Dutta, JRF-DST-SERB POWER

Alok Kumar Deb, Division of Epidemiology and Data Management

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

- Participated as a Panelist at Hand Hygiene Summit (2nd Edition; online) for Rural & Urban Challenges of Hand Washing in India, organized by Integrated Health & Wellbeing (IHW) Council on May 05, 2022.
- Attended a virtual meeting on 'Climate-related Disasters and Health: Futuristic Approach & Agenda Forward' organized by National Institute of Disaster Management, New Delhi on September 23, 2022.
- Participated in the National Pre-Surveillance Meeting (NPSM) for HIV Sentinel Surveillance 2022-23 organized by NACO in New Delhi during October 12 – 13, 2022.
- Participated in the workshop on 'Mathematical modelling of infectious diseases focusing on tuberculosis' organized by ICMR-NIRT, Chennai during November 14 – 16, 2022.
- Acted as a Resource person for 'Regional Pre-Surveillance Meeting and Training of Trainers (ToT) for HSS 2023 at ICMR-NICED organized by NACO & ICMR-NICED during November 23 – 25, 2022.
- Served as Question Paper Setter for Master of Medical Science & Technology (MMST) course of School of Medical Science and Technology, Indian Institute of Technology (IIT), Kharagpur in January, 2023.
- Attended a Webinar on 'Virtual Trials: Decentralizing Clinical Research' organized by ICMR-HQ on January 24, 2023.
- Attended a Webinar on Implementation Research organized by ICMR-HQ on January 28, 2023.
- Participated as an expert in the Expert Consultation for Monitoring, Evaluation, and Learning (MEL) framework for the National Action Plan on Climate Change and Human Health (NAPCCHH) organized by The Energy and Resources Institute (TERI) on February 21, 2023.
- Participated in the Qualitative training on situational analysis (online) organized by ICMR-NARI on March 21, 2023.
- Attended the T20 Task Force 3 seminar series on "Sustainable Consumption and Production, Climate Crisis and One Health" on March 31, 2023.

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

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

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

Co- Principal Investigator:

Dr. Suman Kanungo, Scientist F

Dr. Alok Kr Chakrabarti, Scientist E

Dr. Agniva Majumdar, Scientist C

Primary Objective: To evaluate the immunogenicity of GEMCOVAC-19 compared to COVISHIELD™ at Day 43.

Secondary Objectives:

- To assess the safety, reactogenicity, and tolerability of GEMCOVAC-19.
- To evaluate the immunogenicity of GEMCOVAC-19 at Day 29, Day 119, and Day 209.
- To evaluate the NAb titers against SARS-CoV-2 following 1st and 2nd dose of GEMCOVAC-19 in comparison with COVISHIELD™.
- To evaluate cellular immune response generated in the subjects at different time points from GEMCOVAC-19 in comparison with COVISHIELD™.

Study Design:

- Seamless Phase II/III study
- Randomized, observer blind, active controlled study
- 4000 healthy subjects of ≥ 18 years of age; ICMR-NICED had enrolled 125 participants. Drop out was 3 till end of study.
- All the enrolled subjects i.e., 4000 subjects made 'Safety Arm' whereas 2916 subjects who gave consent for immunogenicity blood collection formed the 'Immunogenicity Arm'. Subjects in the 'Immunogenicity Arm' were randomized in 2:1 randomization scheme such that 1944 subjects were planned to receive GEMCOVAC®-19 and 972 subjects were planned to receive COVISHIELD™. As per version 5 protocol dated 05-May-2022, sample size for 'Immunogenicity Arm' was recalculated for testing NI, which was 714 subjects with a distribution of 476 randomized subjects in the GEMCOVAC®-19 arm (378 evaluable subjects) and 238 randomized subjects in the COVISHIELD™ arm (189 evaluable subjects)] with power of at least 90% for NI testing.

Methods:

- 7-day screening period (Day -6 to Day 0); RT-PCR test at baseline (Day 1) → Dose 1 of study vaccine administered intramuscularly in deltoid region of the arm → Dose 2 of study vaccine administered at Day 29
- Solicited AEs collected for 7 days post each vaccination
- Unsolicited AEs and SAEs collected from Day 1 till Day 57 (+7 days)

- Beyond Day 57 and up to Day 365 (± 7 days), only related unsolicited AEs need to be captured in the electronic case report form (eCRF)
- Post vaccination 7-day follow up visits i.e., Day 8 (+2 days) and Day 36 (+2 days) were telephonic visits to assess subject's health and review the subject diary
- Myocarditis was considered as an adverse event of special interest (AESI)
- Blood samples for immunogenicity assessment collected from subjects who were part of the 'Immunogenicity Arm' at 6 visits - Day 1, Day 29, Day 43, Day 57, Day 119, Day 209
- Primary immunogenicity assessments (anti-spike IgG GMT) and cPASS assay performed in 714 subjects who were part of 'Immunogenicity Arm'
- Other immunogenicity assessments including pseudovirus neutralization assay, cellular immune response and PRNT50 neutralization assay performed in subset of the subjects of 'Immunogenicity Arm'

Safety Summary:

- Approximately 45% of subjects in both arms experienced at least one solicited adverse event following vaccination.
- Rates of local solicited events: 31.0% in GEMCOVAC®-19 arm, 26.4% in COVISHIELD™ arm.
- Rates of systemic solicited events: 31.9% in GEMCOVAC®-19 arm, 34.1% in COVISHIELD™ arm.
- All local solicited events were below Grade 3 intensity per DAIDs criteria.
- No fatal solicited events or subject discontinuations occurred.
- 2.0% of subjects reported at least one unsolicited adverse event.
- Majority of unsolicited adverse events were Grade 1 severity.
- 16 serious adverse events were reported, with three leading to fatal outcomes.

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

Principal Investigator: Dr. Suman Kanungo, Scientist F

Co-Investigator:

Dr. Shanta Dutta, Director, and Scientist G

Dr. Alok Kumar Chakrabarti, Scientist E

Dr. Shubarna Chakraborty, Scientist B

Objective:

This study enrolled 1000 participants (NICED enrolled 100 participants) to receive third dose of COVAXIN and 1000 participants receiving third dose of COVISHIELD and follow up is ongoing.

Primary

Characterize SARS-CoV-2 specific humoral and cellular immune response after homologous/heterologous additional third dose of COVISHIELD/COVAXIN vaccine at

- Baseline, 2 weeks, 4 weeks, Three months, 6 months, 9-12 months after third dose

Secondary

Estimate the incidence of SARS -CoV-2 infection post third dose of COVID-19 vaccine

- Last follow up is in progress

Table 1 describes the observations from the data updated in REDCAP till 20th June 2023.

Date of IEC Approval	09th Feb 2022
Date of first participant enrollment	16th Feb 2022
Baseline sample collected	100
Week 4 sample collected	97
3rd month sample collected	90
6th month sample collected	84
9th month sample collected	74
15th month sample collected	06

Strengthening/Promoting evidence-based advocacy for influenza prevention and control in India (INSPIRE - II)

Dr. Suman Kanungo (PI)

This is a community-based study funded by All India Institute of Medical Sciences, New Delhi in collaboration with Centre for Disease Control and Prevention, Atlanta, USA. This study will generate estimates of influenza associated mortality through modeling based on data from national sample registration survey for the first time in India, by building on the work done by this group of investigators.

This is the first community based multi-site study in India to define the epidemiology and risk factors of influenza and other respiratory viruses associated ARI among elderly population. A total of 1500 elderly with their written informed consent were enrolled from one of the administrative wards (Ward-58) in Kolkata Municipal Corporation in June 2018 at NICED site.

This study estimated –

- the incidence of influenza- and RSV- associated acute respiratory infections (both upper and lower), outpatient clinic visits and hospitalizations among a community dwelling cohort of older adults (>60 years) at four study sites in India
- identify risk factors for influenza- and RSV-associated ALRI, hospitalization, ICU admission and mortality among older adults (>60 years) at four sites in India
- effect of influenza and RSV infection on frailty and cognition among a community dwelling cohort of older adults (>60 years) at four study sites in India

Interim Result:

Among the enrolled participants (1090 enrolled across sites) Influenza viruses were detected in 12.3% and RSV in 2.2% of the cases.

Presence of comorbidities like diabetes and cardio-vascular disease were significantly associated with adverse outcomes. Unconsciousness, blood urea nitrogen level >19gm/dl and blood oxygen saturation <94% at admission increased the risk of death. Presence of Influenza or RSV did not significantly alter the outcomes.

Awards/ Honours received

- a. Fellow of Indian Public Health Association
- b. Member of National Academy of Medical Sciences, New Delhi
- c. Joint Editor Indian Journal of Public Health
- d. Fellow of West Bengal Academy of Science & Technology (WAST)

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

Topic of Trainings/ Conferences/ Seminars/ Webinars etc.	Conducted By	Period	
		From	To
7 th Meeting of the Global Task Force for Cholera Control (GTFCC) – WASH Working Group	WHO - GTFCC	09.03.2022	10.03.2022
9 th Annual Meeting of the Global Task Force on Cholera Control (GTFCC)	WHO - GTFCC	27.06.2022	29.06.2022
Attended in Executive Program in Public Health Policy, Leadership & Management	AIIMS – Jodhpur	01.07.2022	31.01.2023
Attended & Organized 16 th Asian Conference on Diarrheal Disease and Nutrition (ASCODD) (Joint Convenor-Scientific Committee)	ICMR – National Institute of Cholera & Enteric Diseases	11.11.2022	13.11.2022
GTFCC Country-level Surveillance subgroup meeting	WHO - GTFCC	05.12.2022	05.12.2022
GTFCC WASH Hybrid meeting	WHO - GTFCC	21.03.2023	21.03.2023
Organized Zonal Stakeholder meeting on Prevention & control of Influenza & other respiratory viruses – East Zone	Jointly organized by ICMR – NICED; AIIMS Delhi; US-CDC	21.03.2023	22.03.2023

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

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

This facility based cross sectional study is planned to estimate prevalence of malnutrition, immunization coverage, chemoprophylaxis adherence and factors associated based on assessment of 300 HIV infected children (1-14 years) registered in Pediatric Centre of Excellence at Medical College & Hospital, West Bengal. Major finding so far based on analysis of 150 children were malnutrition (48%), Vitamin D3 deficiency (74%) and dietary calorie deficit (77%). Malnutrition (Z score below -2SD in any indicator) was more among boys than girls (58% vs 31%.) and more among them who received ART <5 years as compared to them who received for 5 years or more.

Only 68% children were fully immunized as per National Immunization Schedule, none of them received any vaccine outside NIS but recommended in NACO guideline. Thus this study will generate evidence on nutritional and immunization deficiency and adherence gap if any in reference to national dietary guidelines for HIV infected children for further policy direction.

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 399 specimens. Out of which 313 were of UTI cases, 10 were from septicemia patients, 70 rectal swabs from diarrhea patients and 6 throat swabs from URTI cases. Isolation rate in urine sample was 12.5% isolation rate in rectal swab was 13% and isolation rate for throat swab-50% . The most common pathogen isolated in urine specimen causing UTI was *E.coli* with higher sensitivity to Aminoglycosides (Amikacin, Gentamicin) and Nitrofurantoin. *S.flexneri 2a* was the commonest organism identified from the stool samples showing sensitivity to third generation cephalosporins , azithromycin and azetreonam.

Staph aureus was identified in most of the throat swabs and showed 100% sensitivity to tetracycline. Whereas, from Bankura district, 18% of the blood specimens collected from septicemic patients showed growth and mostly those were MRSA showing high resistance to ampicillin, azithromycin, cefoxitin. Prescription are under evaluation to describe prescribing variation among different tiers. 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.

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

This ICMR funded cross-sectional study was conducted over 8 months involving 300 suspected UTI cases recruited from one SDH (Baruipur SDH) and one BPHC (Sonarpur BPHC) of South 24 Parganas district through consecutive sampling. For diagnostic validation, Rapidogram test was conducted using part of urine sample and remaining urine sample was processed for culture and antibiogram. 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 study finding the kit has been taken up by NHSCR for health system implementation. The manuscript from the study has also been communicated to the journal for publication.

Priorities for the Environmental Dimension of Antimicrobial Resistance (AMR) in India.

This was a UNEP funded project to determine priorities for the environment dimension of AMR in India through scoping review and Key Informant Interview of relevant stakeholders.

This robust report generated through deep diving into dimensions of 'One health', envisages overall cognizance of the policy decision makers about the scope of emerging AMR on human health, animal health, and its impact on the environment. Salient aspect emerged out of the study highlights on effluents containing antibiotic residues from pharmaceuticals and healthcare facilities, expired drugs, excreta from households, manures and litters from livestock being responsible to pollute the environment (water and soil) with Antimicrobial Resistant Bacteria (ARB), Resistance Genes (RGs) and antimicrobial residues. The present report is expected to provide directives towards adopting future strategies, focusing investment and identifying leadership in containment of AMR at the national level. The report has been shared with all key stakeholders and made available in public domain (NICED Website). The policy paper has also been published in the journal.

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

This study is ongoing two facilities namely Baruipur SDH and Sonarpur RH in S 24 PGS district of West Bengal. So far for common infections like Urinary Tract Infection, we have seen that though only 12% of urine specimen shows growth, at least one antibiotic was prescribed for 44% of the cases, whereas in 2% of the prescription multiple antibiotics were also prescribed. In all acute diarrhoeal disease cases, at least one antibiotic has been prescribed, however the isolation rate was only 13%. Still fluoroquinolones are mostly prescribed drug in primary and secondary level hospitals, however all the identified organisms from stool samples showed 100% resistance to them. From qualitative data analysis, the major themes those raised as barriers towards rational antibiotic prescribing behavior were lack of awareness among prescribers regarding AMR, no scope of structured educational orientation programs for prescribers focused towards AMSP, lack of scope of microbiology support, clinician's autonomy being interfered by too many guidelines, pressure from patient/family members of patients; unaware about current antibiotic guidelines.

Evaluation of Prescription Patterns of Drugs for Diarrheal Diseases and Acute Respiratory Infection in Medicine and Pediatrics OPDs of Tertiary Care Hospitals in West Bengal, India.

Drug utilisation studies are relevant for the analysis of prescription rationality and are pertinent in today's context of the increasing burden of antimicrobial resistance. Prescriptions for patients with diarrhoea and Acute Respiratory Infection (ARI) have been analysed in this study to understand the prescription pattern among various categories of prescribers in two tertiary care centers. This cross-sectional study was conducted from August 2019 to December 2020 in the medicine and pediatrics outpatient departments of two government teaching hospitals in West Bengal, India. A total of 630 prescriptions were evaluated against WHO standards. Prescriptions were assessed by a 'Rational Use of Medicine Consensus committee' approach. The Fixed Dose Combination (FDC) was used in half of the patients (51%). Both the generic prescription (23.3%) and adherence to hospital formulary rates (36.5%) were low. The antibiotics prescription rate was high (57%), and it was higher for diarrhoea than ARI. Deviations from the standard treatment guidelines were found in 98.9% of prescriptions. Deviations were commonly found with prescriptions written by the junior doctors (99.6%). Irrational prescribing patterns prevail in tertiary care centers and indicate the necessity of awareness generation and capacity building among prescribers regarding AMR and its unseen consequences.

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

Topic of Trainings/ Conferences/ Seminars/ Webinars etc.	Conducted By	Period	
		From	To
Workshop on "Antimicrobial Resistance (AMR) and implications for human and environmental health in Asia"	European Union	07.04.2022	08.04.2022
Training for Covid Vaccine Post Introduction	WHO	13.04.2022	13.04.2022

Evaluation			
ICMR-DHR BIOMEDICAL & RESEARCH ETHICS UPDATE workshop	ICMR- NCDIR	18.05.2022	18.05.2022
Workshop on “Promoting best practices to tackle antimicrobial resistance (AMR) in Asia from a One Health perspective: Research and Innovation	European Union	24.05.2022	25.05.2022
ICMR Health Communication Conclave	ICMR Communication Unit	15.07.2022	15.07.2022
State Action Plan Meeting for Containment of AMR	WHO & CSE	08.08.2022	10.08.2022
National Action Plan Workshop for AMR	NCDC and ISID	26.09.2022	27.09.2022
Asian Conference on Diarrhoeal Disease and Nutrition and Presented Poster titled – “Prevalence of malnutrition and related nutrient deficiencies among children living with HIV/AIDS; A facility based cross sectional study.”	ICMR - NICODE	11.11.2022	13.11.2022
ICMR Health Communication Course -1 st Contact session	ICMR Communication Unit	14.11.2022	18.11.2022
Meeting for MRHRU	NBMCH	08.12.2022	09.12.2022
Disease Elimination Prioritization Meeting	ICMR- NARI	21.02.2023	22.02.2023
International Symposium on Health Technology Assessment	DHR	10.03.2023	10.03.2023
Zonal Stakeholders consultation meeting on Influenza and other respiratory viruses- East Zone	ICMR – NICODE, AIIMS New Delhi & CDC	21.03.2023	22.03.2023
India -UK AMR Surveillance Workshop	WHO	23.03.2023	24.03.2023
HIV Burden Estimation Workshop	NACO	27.03.2023	31.03.2023
Fellowship in Infectious Disease (online)	Medigrad, Singapore	01.01.2023	31.12.2023

Brief outline of Training & Extension activities

1. Involved in organizing Asian Conference on Diarrhoeal Disease and Nutrition at Hotel Westin Kolkata from 11-13 November 2022.
2. Involved in organizing World Antimicrobial Awareness Week Program at ICMR- NICODE Kolkata on 24 November 2022.

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

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

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

Co-Investigators:

From ICMR-NICED:

Dr. Shanta Dutta, Director & Scientist G

Dr. Alok Kumar Deb, Scientist F, Division of Epidemiology

Dr. Asish Mukherjee, Scientist F, Division of Bacteriology

Dr. Sulagna Basu, Scientist F, Division of Bacteriology

Dr. Agniva Majumder, Scientist C, Division of Bacteriology

From State Health Department (IDSP):

Dr. Dipankar Maji, DDHSPH & SSO IDSP

Mr. Palash Mandal, State Microbiologist, IDSP

The AMRES research team has been able to generate data on organism and their AST profile of common infections like diarrhoeal diseases; urinary tract infection; ARI; fever from all three tiers of health care system in South 24 Parganas and Bankura district of West Bengal. South 24 Parganas district health authority used the data generated through this project for developing district specific antibiotic prescription guideline for common infections.



AMRES team field visit at BankuraSammilani Medical College, 14th February 2023



AMRES team field visit at Anchuri BPHC, Bankura, 15th February 2023

M. Sharma, Epidemiology and Data Management Division

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

- Presented poster on “Overweight & obesity as a public health problem in India: a systematic review of potential interventions” at ASCODD 2022
- Supervised dissertation for one student pursuing MPH from Maulana Abul Kalam Azad University of Technology, West Bengal, has completed her internship from 1st February 2023 to 31st March 2023
- Participated in Induction Training of new scientists at 3rd Induction training to new Scientists on Research Methodology, Bio-Statistical techniques, Health Data Management and its analysis, using Statistical Software" held at the ICMR - National Institute of Medical Statistics, New Delhi, from 6th February and 10th February 2023.

M. Bhaumik (Principal Investigator), Immunology Division

Gut microbial butyrate and the role of regulatory T and B cells in pathogenesis of Inflammatory Bowel Disease (IBD)

The knowledge of the intricate but complex interactions between the immune system and the microbiome or microbial products has been substantially improved in the past decade. Nonetheless, there are still numerous questions and difficulties in delineating the roles played by the immune system and the microbiome in health and disease. Regulatory T and B cells are critical for maintaining immune homeostasis and establishing immune tolerance to foreign microbial antigens in the intestine. In the last decade there has been an explosion in deciphering the effect of gut microbiome and its metabolites like butyrate on T regulatory cells contributing to the complex pathogenesis of inflammatory bowel disease (IBD), which includes Crohn's disease and ulcerative colitis during onset or development of that disease. Because of their multiple suppressive mechanism T regulatory cells are evolving as a promising therapy for IBD. However, in the majority of circumstances, a direct causal link between the microbial metabolites and regulatory cells particularly Breg cells have not been shown. More mechanistic research is needed to examine how the microbiome affects immune tolerance in both healthy and diseased states. These microbiome-derived metabolites that are found at high concentrations throughout the gut and in the systemic circulation may modulate vast variety of immune responses. The study aims to provide understanding on the role of gut microbial butyrate on T and B regulatory cells, in the hope to gain insight on the development, mechanism of activation, and action as well as their potential roles in IBD.

New Intervention: Since there is no effective therapy for IBD, butyrate treatment with rIL-27 therapy can be a therapeutic option for IBD.

Designing morpholino (GMO-PMO) based therapy for IBD targeting the genes of RNA binding protein (s) responsible for inflammation

Developing effective therapeutics for IBD requires an understanding of the complex molecular mechanisms, such as aberrant mRNA stability pathways, that underlie the inflammatory phenotype of gut epithelium. Among common sequence features that affect mRNA stability are the AU-rich elements (AREs) which are present in nearly 4000 mammalian transcripts, including labile mRNAs of inflammatory cytokines and mediators that participate in disease progression in IBD. This stabilization can be caused by reduced activity of mRNA decay promoting RBPs such as Tristetraprolin (TTP, ZFP36) or increased activity of mRNA stabilizing RBPs, such as human antigen R (HuR, ELAV1) as reviewed by multiple studies. Competition between these stabilizing and decay promoting RBPs for binding to similar sequences at the ARE region may decide the final fate of the mRNA. It is imperative to have a knowledge of the upstream causes of TTP:HuR imbalance and its ramifications and search for possibilities for experimental correction and therapeutic targeting.

Morpholino better called phosphorodiamidate morpholino oligomer (PMO), clinically used for muscular dystrophy brings strength to its potential as therapeutic technology in diseases having limited chemotherapeutic options. The PMO that will be used in the study have a unique feature of cell penetration without any vehicle and damaging the cell. Although PMO therapy for DMD is approved by FDA, an efficient PMO delivery strategy is required to improve the therapeutic efficacy in DMD patients. Taking into account the lessons learnt from PMO based therapy in DMD, the study proposes a self transfecting unique PMO that can overcome the drawback of PMO and can be used in other diseases in future.

Therefore, the project aims to elucidate the details of the aberrant roles of the RBPs and the possibility of experimental restoration of their normal expression and function by using morpholino based therapy to reduce inflammation in DSS induced colitis.

New Intervention: Since there is no effective therapy for IBD, GMO-PMO treatment can be a therapeutic option for IBD.

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

- Attended and completed Health communication course of ICMR
- Attended conference of Society for Biological Chemists, Kolkata in December 2022.

Post and Pre-Doctoral Fellows:*Pre-Doctoral Fellows:*

Mr. Mainak Chakraborty, SRF-CSIR

Ms. Oishika Das, SRF-DST

Ms. Aaheli Masid, JRF-CSIR

S. Ganguly (Principal Investigator), Parasitology Division

Identification and molecular characterization of common enteric parasites in Kolkata. Funded by ICMR (PI) 2016-21

To streamline the genotyping process for *G. duodenalis*, a method was developed that is efficient, cost-effective, and provides rapid results without the need for sequencing. The multiplex PCR-RFLP method was employed to genotype human isolates of *G. duodenalis*. The method enables simultaneous identification and differentiation between assemblage A and B through nested multiplex PCR targeting the *tpi* locus. After amplification a band at 756bp will appear for assemblage A whereas for assemblage B there will be a band at 614bp (Fig 18). In case of a mixed infection 2 separate bands will appear on the agarose gel indicating presence of both assemblages. For differentiation between subassemblages we employed RFLP technique utilizing 3 restriction enzymes. A single enzyme *RsaI* is used to distinguish the AI and AII subassemblages (Fig 19), while a double digestion reaction with *XhoI* + *BstBI* is used to differentiate BIII from BIV (Fig 20). Upon digestion with *RsaI*, AI subassemblage will produce a prominent band at 580bp and 2 faint bands at 110bp and 66bp. On the other hand, the for AII subassemblage 4 bands at 370bp, 210bp, 110bp and 66bp will appear. This difference in digested fragmented profile will help to differentiate among these subassemblages. After double digestion, BIII subassemblage will produce bands at 434bp and 180bp whereas BIV will produce a band at 314bp and 2 close bands at 180bp and 120bp. This RFLP method is able to identify mixed infection with 2 different subassemblages as well. The protocol was found to be highly sensitive and specific. This approach has the potential to be a valuable tool in the accurate and efficient diagnosis of giardiasis, particularly in regions where the prevalence is significant.

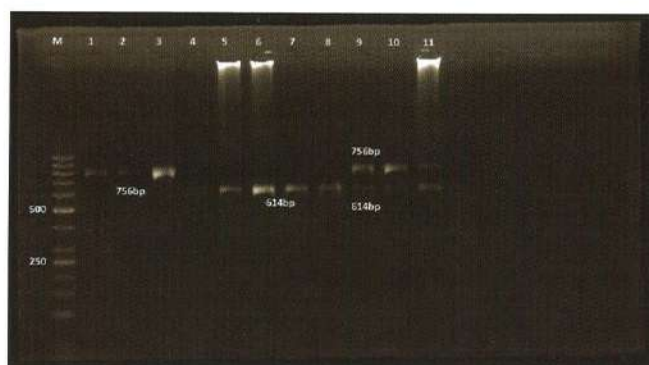


Fig 18: Multiplex PCR to differentiate Assemblage A and B of *Giardia duodenalis* based on *tpi* locus: M- 50bp marker; L-1,2,3- Assemblage A isolates; L- 4,5,6,7- Assemblage B isolates; L- 8,9,10,11- Mixed infection with both assemblages having two distinct bands.

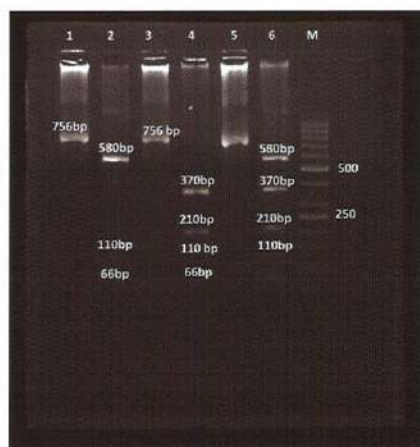


Fig 19: RFLP pattern obtained after RsaI digestion: L-1: Assemblage AI uncut; L-2: Assemblage AI cut; L-3: Assemblage AII uncut; L-4: Assemblage AII cut; L-5: Mixed sample of AI and AII uncut; L-6: Mixed sample of AI and AII cut; M- 50bp marker



Fig 20: RFLP pattern obtained after double digestion with XhoI+ BstBI: M- 50bp marker; L-1: Assemblage BIII uncut; L-2: Assemblage BIII cut; L-3: Assemblage BIV uncut; L-4: Assemblage BIV cut; L-5: Mixed sample of BIII and BIV uncut; L-6: Mixed sample of BIII and BIV cut.

Amoebiasis is an infection caused by enteric protozoa, most commonly *Entamoeba histolytica*, and is globally considered a potentially severe and life-threatening condition. To understand the impact of the parasite genome on disease outcomes, it is important to study the genomes of infecting strains in areas with high disease prevalence. These studies aim to establish correlations between parasite genotypes and the clinical presentation of amoebiasis. We employ a strain typing approach that utilizes multiple loci, including SREHP and three polymorphic non-coding loci (tRNA linked array N-K2, loci 1-2, and 5-6), for high-resolution analysis. Distinct clinical phenotypes isolates underwent amplification and sequencing of studied loci. The nucleotide sequences were analysed using Tandem Repeats Finder to detect short tandem repeats (STRs). These patterns were combined to assign a genotype, and the correlation between clinical phenotypes and repetitive patterns was statistically evaluated. This study found significant polymorphism in the size and number of PCR fragments at SREHP and 5-6 locus, while the 1-2 locus and NK2 locus showed variations in PCR product sizes. Out of 41 genotypes, two (I6 and I41) were significantly associated with their respective disease outcomes and were found in multiple isolates. We observed that I6 was linked with a symptomatic outcome, with a statistically significant p-value of 0.0183. Additionally, we found that I41 was associated with ALA disease outcome, with a p-value of 0.0089 (Table 2). Our study revealed new repeat units not previously reported, unveiling the genetic composition of *E. histolytica* strains in India, associated with distinct disease manifestations.

Table 2: List of identified genotypes (I1 to I41) resulting from the combination of four independent studied loci. Identified sequence types obtained in this study were assigned with alphanumerical codes.

Infection outcome	Sample ID	Sequence pattern				Genotype
		NK2	Locus 1-2	Locus 5-6	SREHP	
Asymptomatic	Kol/A01	K1 _{Ind}	L2 _{Ind}	*A5	S12 _{Ind}	I1
	Kol/A02	K8 _{Ind}	L2 _{Ind}	*A5	S11 _{Ind}	I2
	Kol/A03	K3 _{Ind}	*B	Q2 _{Ind}	S14 _{Ind}	I3
	Kol/A04	K8 _{Ind}	*B	Q2 _{Ind}	S1 _{Ind}	I4
	Kol/A05	K20 _{Ind}	*F	Q2 _{Ind}	-	I5
	Kol/A06	K17 _{Ind}	*F	*A7/Q7 _{Ind}	S7 _{Ind}	^b I6
	Kol/A07	K17 _{Ind}	*F	*A7/Q7 _{Ind}	S7 _{Ind}	^b I6
	Kol/A08	K9 _{Ind}	*F	Q4 _{Ind}	S9 _{Ind}	I7
	Kol/A09	K10 _{Ind}	*E	Q1 _{Ind}	S10 _{Ind}	I8
	Kol/A10	K7 _{Ind}	L3 _{Ind}	*A7	-	I9
	Kol/A11	K17 _{Ind}	*F	*A7/Q7	S7 _{Ind}	^b I6
	Kol/A12	K12 _{Ind}	*F	*A5	S2 _{Ind}	[#] I10
	Kol/A13	K3 _{Ind}	L2 _{Ind}	*A7/Q6 _{Ind}	S3 _{Ind} /S5 _{Ind}	I11
	Kol/A14	^c K5 _{Ind}	*B	*A7/Q7 _{Ind}	S14 _{Ind}	I12
	Kol/A15	K2 _{Ind}	L3 _{Ind}	*A7/Q6 _{Ind}	S13 _{Ind}	I13
Diarrhoea	Kol/D01	K19 _{Ind}	*B	*A5	S15 _{Ind}	I14
	Kol/D02	K2 _{Ind}	L6 _{Ind}	*A6	S10 _{Ind}	I15
	Kol/D03	K4 _{Ind}	L5 _{Ind}	Q1 _{Ind} /*A6	S8 _{Ind}	I16
	Kol/D04	^c K14 _{Ind}	*E	*A6/*A7	S8 _{Ind}	I17
	Kol/D05	^c K11 _{Ind}	L1 _{Ind}	*A5/*A7	S9 _{Ind}	I18
	Kol/D06	^c K18 _{Ind}	L5 _{Ind}	*A5/*A7	S8 _{Ind}	I19
	Kol/D07	K16 _{Ind}	*F	Q2 _{Ind} /*A7	S11 _{Ind}	^c I20
	Kol/D08	K13 _{Ind}	L1 _{Ind}	*A5/*A7	S1 _{Ind}	I21
	Kol/D09	K15 _{Ind}	*B	*A5/*A7	S2 _{Ind}	I22
	Kol/D10	K9 _{Ind}	L1 _{Ind}	Q7 _{Ind}	S12 _{Ind}	I23
	Kol/D11	K15 _{Ind}	*B	*A5/*A7	S1 _{Ind}	I24
	Kol/D12	K15 _{Ind}	*F	Q4 _{Ind} /Q5 _{Ind}	S3 _{Ind} /S4 _{Ind}	I25
	Kol/D13	K1 _{Ind}	*B	Q1 _{Ind}	^c S6 _{Ind}	I26
	Kol/D14	K8 _{Ind}	L1 _{Ind}	Q7 _{Ind}	S7 _{Ind}	I27
	Kol/D15	K3 _{Ind}	*B	*A5	-	I28
	Kol/D16	K8 _{Ind}	*B	Q7 _{Ind}	S15 _{Ind}	I29
	Kol/D17	K15 _{Ind}	L4 _{Ind}	*A5/*A7	S2 _{Ind}	I30
	Kol/D18	K6 _{Ind}	L1 _{Ind}	Q2 _{Ind} /*A7	S3 _{Ind} /S4 _{Ind}	I31
	Kol/D19	K4 _{Ind}	*B	Q1 _{Ind} /*A6	-	I32
	Kol/D20	K9 _{Ind}	L4 _{Ind}	*A5	S10 _{Ind}	I33
	Kol/D21	K20 _{Ind}	L4 _{Ind}	Q1 _{Ind}	S15 _{Ind}	I34
	Kol/D22	K15 _{Ind}	L1 _{Ind}	Q2 _{Ind} /*A7	S5 _{Ind}	I35
	Kol/D23	K19 _{Ind}	*F	Q2 _{Ind}	-	I36
	Kol/D24	K16 _{Ind}	*F	Q2 _{Ind} /*A7	S11 _{Ind}	^c I20
	Kol/D25	K8 _{Ind}	L6 _{Ind}	Q1 _{Ind}	S8 _{Ind}	I37
	Kol/D26	K2 _{Ind}	*F	Q4 _{Ind} /Q5 _{Ind}	S3 _{Ind} /S4 _{Ind}	I38
	Kol/D27	K10 _{Ind}	L6 _{Ind}	Q4 _{Ind} /Q5 _{Ind}	S3 _{Ind} /S5 _{Ind}	I39
Amoebic liver abscess	Kol/ALA01	K6 _{Ind}	L3 _{Ind}	Q3 _{Ind}	S9 _{Ind}	I40
	Kol/ALA02	K7 _{Ind}	L3 _{Ind}	Q4 _{Ind} /Q5 _{Ind}	S11 _{Ind}	^a I41
	Kol/ALA03	K15 _{Ind}	L2 _{Ind}	*A5	S4 _{Ind}	I42
	Kol/ALA04	K6 _{Ind}	L3 _{Ind}	*A5	S15 _{Ind}	I43
	Kol/ALA05	K19 _{Ind}	*E	*A7	-	I44
	Kol/ALA06	K13 _{Ind}	*E	*A7	S13 _{Ind}	I45
	Kol/ALA07	K6 _{Ind}	L5 _{Ind}	Q3 _{Ind}	S15 _{Ind}	I46
	Kol/ALA08	K7 _{Ind}	L1 _{Ind}	Q2 _{Ind}	S1 _{Ind}	I47
	Kol/ALA09	K12 _{Ind}	*F	*A5	S2 _{Ind}	[#] I10
	Kol/ALA10	K7 _{Ind}	L3 _{Ind}	Q4 _{Ind} /Q5 _{Ind}	S11 _{Ind}	^a I41
	Kol/ALA11	K15 _{Ind}	*E	*A5	S2 _{Ind}	I48
	Kol/ALA12	K7 _{Ind}	L3 _{Ind}	Q4 _{Ind} /Q5 _{Ind}	S11 _{Ind}	^a I41

* Already reported pattern.

^b Statistically associated with the asymptomatic group, p=0.0183 (fisher's exact test).

^c Single occurrence observed for these patterns. [#] Observed in both asymptomatic and ALA infection groups.

^a Statistically associated with ALA, p=0.0089 (fisher's exact test). ^e multiple occurrences in the diarrheal group but not statistically significant.

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

Our study aimed to evaluate the mortality rate of *Giardia lamblia*, a frequently encountered water and foodborne parasite, when exposed to varying concentrations of *A. paniculata* aqueous extract. Giardiasis is particularly prevalent in immunocompromised individuals such as children and the elderly, especially in developing countries with inadequate sanitation and hygiene practices.

We assessed the mortality of *Giardia lamblia* exposed to different concentrations of *A. paniculata* aqueous extract. The percentage of cell death varying extract concentration, 1mg/ml killed nearly 50% of the cells in 24 hours and doubling the concentration to 2mg/ml lead to the killing of 98% of the cells (Fig 21). The extract exhibited cell death activity, adherent properties, and induced parasite morphological changes (Fig 22). DNA degradation suggested effects on the parasite's genetic material. Andrographolide, the active compound, demonstrated a remarkable 96% inhibition rate at 200 μ M after 24 hours, comparable to metronidazole. Notably, increasing concentrations of andrographolide led to distinct degeneration in *Giardia* morphology. It also induced excessive reactive oxygen species generation and inhibited various pathogenic factors involved in *Giardia* infection. *Giardia* poses a significant health risk, particularly in lower age groups, especially children, and our findings highlight the potential of *A. paniculata* extract and andrographolide as alternative therapeutic options.

These findings suggest the potential of andrographolide as a therapeutic agent against *Giardia* infection. The existing treatments, such as metronidazole, nitroimidazole, and albendazole, are associated with significant drawbacks including life-threatening side effects, high toxicity, parasitic resistance induction and lengthy treatment duration. These limitations highlight alternative treatments, particularly those derived from plants, which should offer improved safety, efficacy, affordability, and accessibility for low-income populations. The utilization of *A. paniculata* extract could potentially provide a promising alternative for the management of *Giardia* infections, particularly with limited resources.

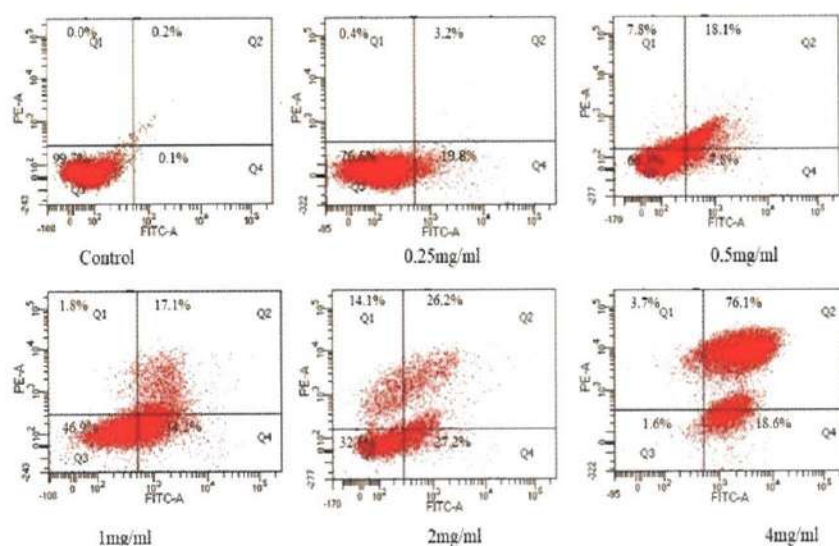


Fig 21: The figure depicts the results of a flow cytometry analysis of cells that were stained with FITC-PI and treated with different concentrations of *Ap* extract. The panel includes a negative control (1A) and five treatment groups, consisting of *Giardia* cells treated with various concentrations of *Ap* extract (0.25 mg/ml in 1B, 0.5 mg/ml in 1C, 1.0 mg/ml in 1D, 2.0 mg/ml in 1E, and 4.0 mg/ml in 1F). The cells were categorized based on their response to treatment, with quadrant Q1 representing necrotic cells, quadrant Q2 representing late apoptotic cells, quadrant Q3 representing living cells, and quadrant Q4 representing early apoptotic cells.

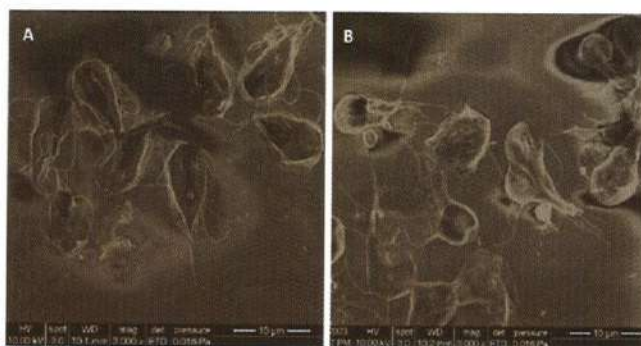


Fig 22: The figure shows a Scanning Electron Microscopy (SEM) image of *Giardia lamblia* trophozoites after being treated with the IC50 concentration of *Ap* extract for 24 hours. Panel A shows untreated cells, where normal *Giardia* trophozoites are observed, and no changes in morphology are evident. In contrast, Panel B shows extract-treated cells where trophozoite morphology has changed, and cell membrane rupture is also observed.

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

Giardia lamblia is a significant cause of diarrheal diseases, particularly in underdeveloped countries, but the exact mechanism of its pathogenesis remains unknown. One intriguing factor involved in the pathogenicity of *Giardia lamblia* is a variant of tenascin, a family of extracellular matrix glycoproteins typically found in vertebrate embryos during development, organogenesis, and in tumour stroma. This particular variant, known as *Giardia*-Tenascin, contains EGF-like repeats and plays a role in both the pathogenesis and encystation processes of *Giardia*, although the underlying mechanisms are not yet fully understood.

To further investigate *Giardia*-Tenascin, we conducted co-cultures of *Giardia lamblia* Portland strain (Assemblage A1) with HT-29 human adenocarcinoma cells. Additionally, we isolated and sequenced the *Giardia*-Tenascin gene using Polymerase Chain Reaction (PCR) and the Sanger Sequencing method. The resulting gene sequence was submitted to the NCBI GenBank and assigned the accession number MW962242. To facilitate the cloning and expression of the *Giardia*-Tenascin gene, we designed specialized cloning primers with incorporated restriction sites. Following Reverse Transcriptase PCR, we successfully isolated the gene and cloned it into the pET28a cloning vector. Our next steps involve expressing the protein, generating antibodies, and characterizing its properties. By conducting these experiments and investigations, we aim to gain a deeper understanding of the pathogenicity of *Giardia lamblia* and the role of *Giardia*-Tenascin in its lifecycle.

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

- *Entamoeba moshkovskii* – new upcoming Entamoeba infection in India. Sanjib Kumar Sardar, Yumiko Saito Nakano, Shanta Dutta, Tomoyoshi Nozaki, Sandipan Ganguly. ICOPA 2022. 21-26 August. Copenhagen, Denmark. Presenter (Oral).

Ph.D. Awarded

Dr. Sumallya Karmakar

Title of Thesis : Studies on Small Nuclear Ribo Nucleo Protein Particles in *Giardia lamblia*

University : Calcutta University

Date of Degree : 29.07.2022

Post and Pre-Doctoral Fellows:

Pre-Doctoral Fellow

Mrs. Rituparna Sarkar, SRF-CSIR

Mr. Sanjib Kumar Sardar, SRF-ICMR

Ms. Ajanta Ghosal, SRF-ICMR

Md. Maimoon Maruf, SRF-CSIR

Mr. Tapas Haldar, SRF-CSIR

A. Pal (Principal Investigator), Pathophysiology Division

Anti-cancer activity of microbial extracellular proteases isolated from environmental microbial isolates

Key achievements:

1. A secretory protease subtilisin was purified and identified from environmental isolate *Bacillus amyloliquefaciens*.
2. Subtilisin, which was used in detergent industry for a long time, was shown to have cancer-killing properties.
3. Subtilisin showed potential to degrade cellular tubulin through ubiquitin proteasome mediated pathway.
4. In terms of cancer therapeutics subtilisin could be considered a microtubulin targeting agent.

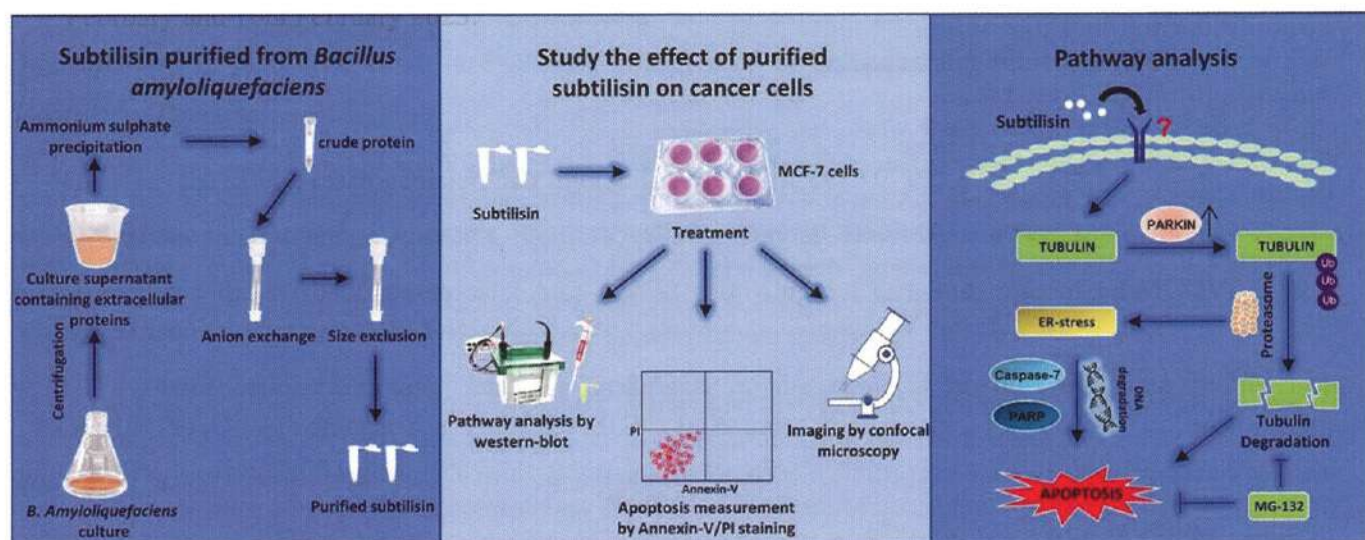


Fig 23: Mechanism of Subtilisin induced apoptosis in breast cancer cells: Subtilisin from *Bacillus amyloliquefaciens* induced PARKIN activation and tubulin degradation that lead to ER-stress that activated caspase-7 and PARP cleavage, thus guiding the subtilisintreated cells towards apoptosis.

Protease activated receptor induced apoptosis in ovarian cancer cells by microbial protease

Key achievements:

1. M84 peptidase was identified from an environmental strain of *Bacillus altitudinis* after a large-scale screening of environmental organisms and this investigation revealed a new role for microbial metallo-protease Peptidase M84 in inducing an anticancer activity on metastatic ovarian adenocarcinoma cells via the attenuation of global PAR-1 activity and ensured the prevalent signalling changes.
2. This protease also increased the percentage of survival in ovarian cancer intraperitoneal mice model upon treatment and indicated the enzymatic activity of Peptidase M84 as one of the essential factors contributing to the treatment of cancer.
3. Peptidase M84 exhibited no obvious cytotoxicity to murine macrophages, human normal ovarian epithelial cell lines and to liver and kidney tissue of C57BL/6 mice as it was a naturally occurring protease.
4. We report that Peptidase M84 protein from *Bacillus altitudinis* as a novel candidate for development of therapeutic strategies against ovarian cancer.

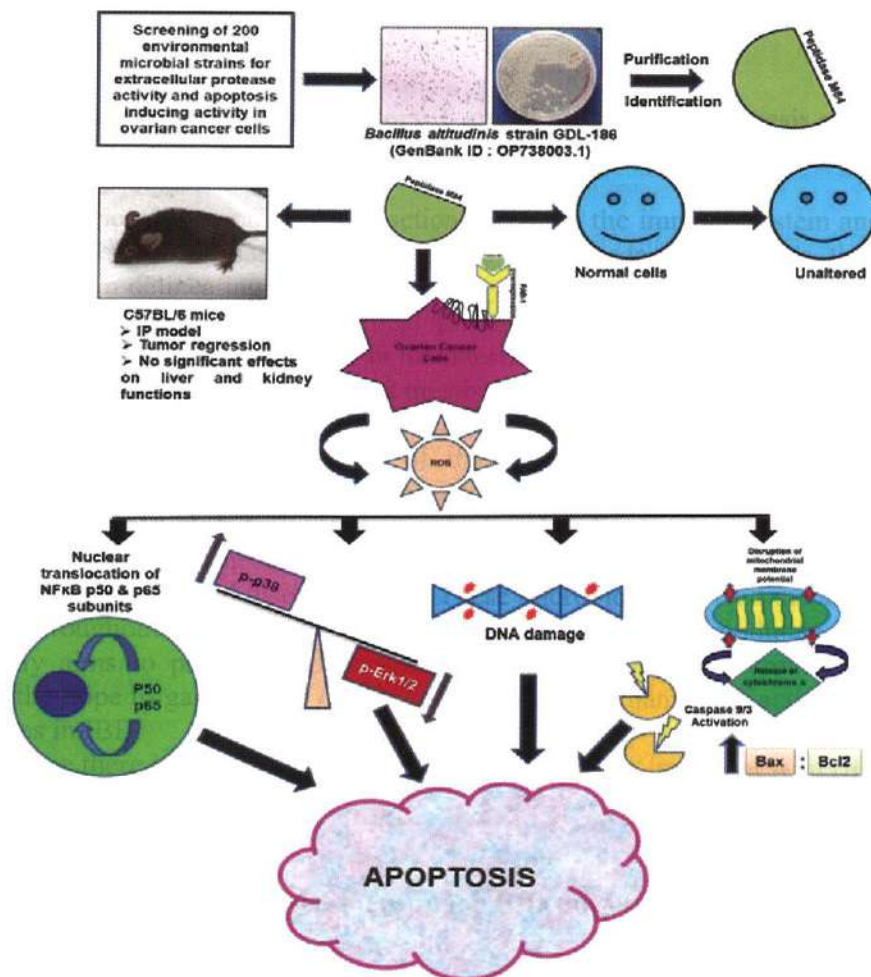


Fig 24: Mechanism of Peptidase M84 mediated apoptotic pathway in ovarian cancer cells. Peptidase M84 by virtue of its proteolytic activity induced activation of PAR-1/ROS axis and triggered apoptosis in malignant cells selectively. Increase in the ROS level in cancer cells allowed the threshold level of cellular ROS to reach earlier than the normal healthy cells. ROS activated the intrinsic pathway of apoptosis in malignant cells.

PhD Awarded:

Name of the student : Dwiprohi Kar

Title of the PhD thesis : Study of the molecular mechanisms of a novel colon cancer therapy by microbial protease mediated apoptosis

University : Jadavpur University

Year of PhD awarded : 2022-23

Post and Pre-Doctoral Fellows

Post-Doctoral Fellow:

Dr. Tanusree Ray, ICMR RA III

Dr. Rima Tapader, ICMR-RA I

Pre-Doctoral Fellow:

Ms. Nanda Singh, SRF-CSIR

Mr. Niraj Nag, SRF-UGC

Mr. Saibal Saha, SRF-UGC

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

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

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

As part of the Institutional diarrheal disease surveillance enteric viruses are tested at Virology lab in NICED to assess the prevalence of viral gastroenteritis among hospitalized children and to monitor circulating strains in the region. This surveillance aims to assess baseline data after RV vaccine introduction in West Bengal. Vast diversity in the RV genotypes and rapid emergence of novel types due to recombination in developing countries raise concern, thus monitoring the strain diversity is important. From April 2022- Mar 2023, 565 stool samples were screened from Dr. B.C. Roy Post-Graduate Institute of Pediatric Sciences (BCH) and Infectious Diseases and Belegghata General Hospital (IDH) of which 64.4% (n=364/565) samples tested positive for one or more enteric viruses. Positivity rates of Rotavirus (30.6%, n=174/565) and Norovirus (15%, n=85/565) were observed at high frequency. Whereas the incidence of Adenovirus (10.8%, n=61/565), Astrovirus (6.0%, n=34/565) and Sapovirus (1.8%, n=10/565) was low. Frequency of Rotavirus and Adenovirus induced gastroenteritis was higher among children belonging to 6-24 months. Among the rotavirus positive samples, G3 (66.45%) was found to be the predominantly circulating genotype, followed by G2 (15.8%) and G1(6.3%). (Fig 25)

During 2022-23, we did genotypic characterization of the archived samples (Jan 2018- Feb 2020) with specific focus on Rotaviruses. Genotyping of Rotavirus was carried out by conventional polymerase chain reaction (PCR) which was then followed by sanger sequencing. Nucleotide BLAST software was used for the genotyping and phylogenetic analyses were conducted by MEGA 11. Among the Rotavirus positive samples G3 was predominant genotype with 45.5% (n=361/793) positivity followed by G9 (19.17%), G1(8.95%), G2(4.92%) and G12(2.14%). Rare GARV genotypes like G10P[6] (0.25%; n=2/793) and G6P[14] (0.25%; n=2/793) were also detected at low frequency.

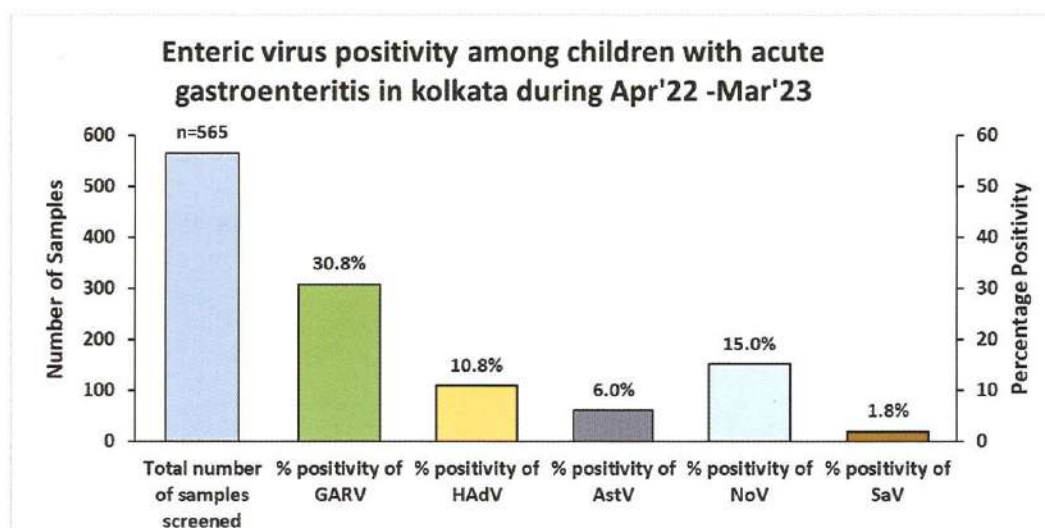


Fig.25 Enteric virus positivity among children (≤ 5 years) with acute gastroenteritis in Kolkata during Apr'22 to Mar'23.

Host-Rotavirus Interaction Studies: Rotaviral protein NSP4 trigger necroptosis partially involving RIP1 and fully involving RIP3-MLKL axis

Mamta Chawla Sarkar (PI)

Rotaviruses exploit host immune surveillance pathways for their own benefit. It was noted that in presence of apoptosis inhibitors, alternative cell death mechanism called Necroptosis was activated to release the progeny virions. NSP4 triggered necroptosis in a calcium influx dependent manner by interacting with RIP1 and RIP3 complex which recruits MLKL. However, unlike canonical necroptosis that involves kinase dependent phosphorylation of RIP1 and RIP3, RV infection doesn't phosphorylate RIP1 but indispensably requires RIP3 phosphorylation for necroptosis execution and viral replication (Fig 26)

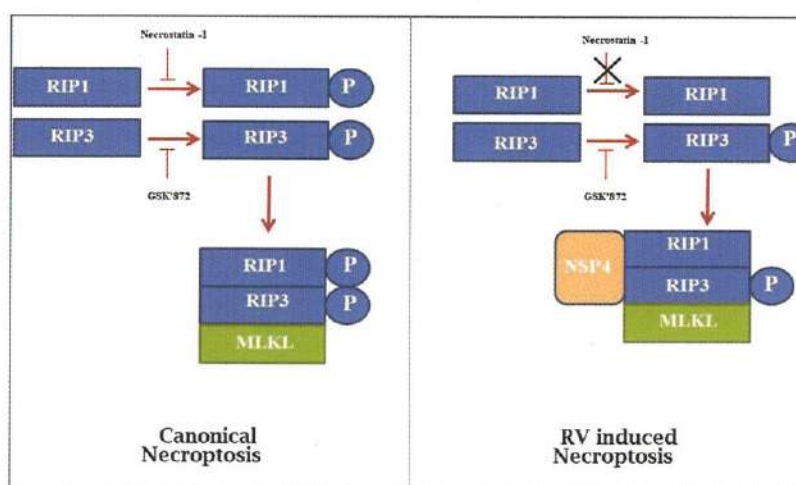


Fig.26 Rotaviral protein NSP4 trigger necroptosis partially involving RIP1 and fully involving RIP3-MLKL axis.

In pursuit for host targeted antiviral therapeutics

Mamta Chawla Sarkar (PI)

Anti-rotaviral potential of Ivermectin and Importin

Rotavirus is the foremost cause of acute gastroenteritis among infants in resource-poor countries, causing severe morbidity and mortality. The currently available rotavirus vaccines are effective in reducing severity of the disease but not the infection rates, thus antivirals as an adjunct therapy are needed to reduce the morbidity in children. Viruses rely on host cellular machinery for nearly every step of the replication cycle. Therefore, targeting host factors that are indispensable for virus replication could be a promising strategy.

We found that rotavirus infection induces the expression of two important host factors namely Importin-β1 and Ran that are the principal components of the classical nuclear import pathway. Knocking down importin-β1 severely impaired rotavirus replication, suggesting a critical role for importin-β1 in the rotavirus life cycle. In vitro studies revealed that treatment of ivermectin and importazole resulted in reduced synthesis of viral proteins, diminished production of infectious virus particles, and decrease in viroplasm-positive cells. Mechanistic study proved that both drugs perform anti-rotavirus activity by inhibiting the function of importin-β1. In vivo investigations in mice also confirmed the anti-rotavirus potential of importazole and ivermectin at non-toxic doses. Treatments of rotavirus-infected mice with either drug resulted in diminished shedding of viral particles in the stool sample, reduced expression of viral protein in the small intestine and restoration of damaged intestinal villi compared to untreated infected mice. The study highlights the potential of importazole and ivermectin as anti-rotavirus therapeutics.(Fig 27).

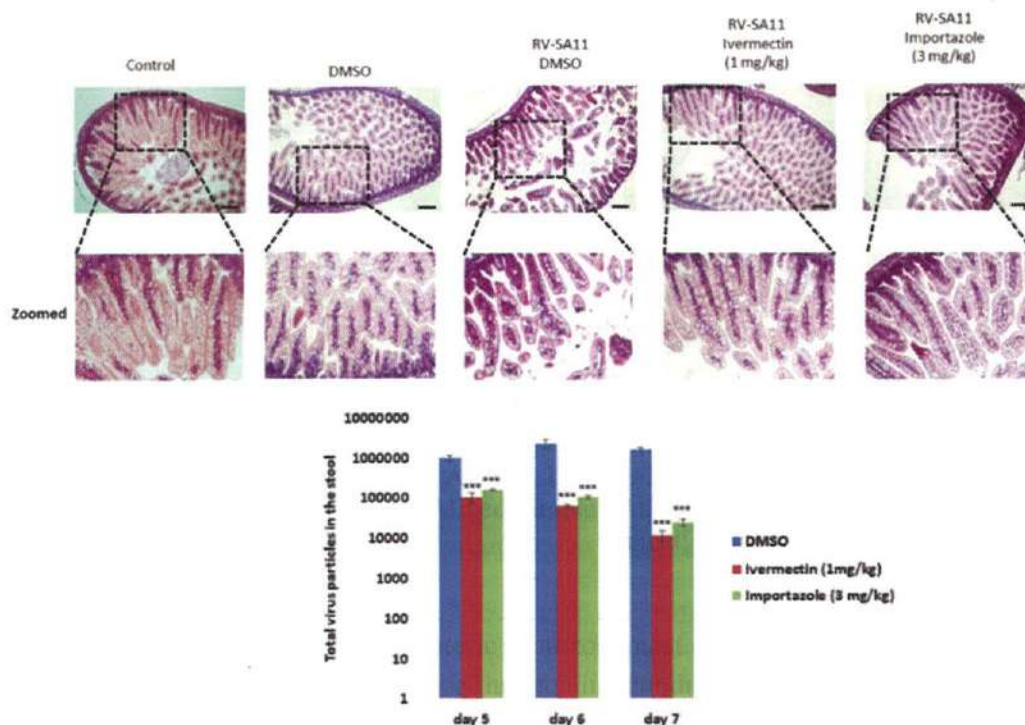


Fig.27 Anti-rotaviral potential of Ivermectin and Importazole

(A) Importazole (0.1 μ M, 2.5 μ M, 5 μ M, 10 μ M, 20 μ M, and 40 μ M) and ivermectin (0.1 μ M, 1.25 μ M, 2.5 μ M, 5 μ M, 10 μ M, and 20 μ M) were used to calculate IC_{50} . (B) HE staining of the small intestinal tissue section of control mice and RV-SA11-infected mice treated with either DMSO or drugs (ivermectin and importazole) at day 7. Scale bar 30 μ m. (C) Quantification of rotavirus particle in the stool samples of RV-SA11 infected mice was performed at day 5, day 6, and day 7 post-three consecutive treatments of ivermectin (1 mg/kg/day) and importazole (3 mg/kg/day) after infection by Premier®Rotaclone® kit according to the manufacturer's instructions. The data was represented as "total virus particles". Each bar represented mean virus particles \pm SD of three independent experiments (Unpaired student's t-test, *** $p < 0.001$).

Quercetin a phytochemical has potent anti-rotaviral activity in vitro and in vivo

Few phytochemicals were tested to assess anti-rotaviral potential. We found quercetin having the most potent compound among the tested compounds. In vitro study demonstrated that quercetin treatment reduced the yield of RV-SA11 (simian strain), A5-13 (bovine strain) and Wa (Human strain) viral particles in a dose dependent manner. In line with this finding, viral proteins also found to be reduced in quercetin treated RV-SA11 infected MA104 cells compared to vehicle (DMSO) treated controls. The IC_{50} of quercetin against three RV strains ranges between 2.79 - 4.36 μ M and S.I. index is greater than 45. In vivo study revealed lower expression of viral proteins and viral titre in the small intestine of quercetin-treated infected mice compared to infected animals treated with a vehicle, in parity with the in vitro findings. Furthermore, the results suggested anti-rotaviral activity of quercetin to be interferon independent. Mechanistic study showed that quercetin inhibits RV infection by inactivating RV-induced early activation of NF- κ B pathway (Fig 28)

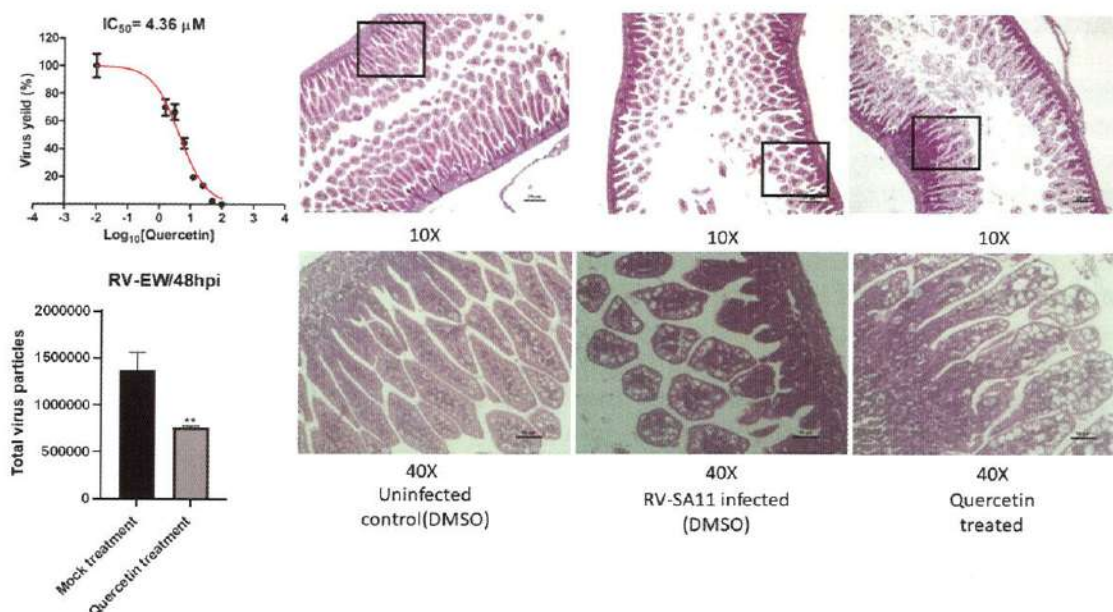


Fig.28 Quercetin, a phytochemical having potent anti-rotaviral activity in vitro and in vivo:

(A) Plaque assay was performed from RV-SA11 (MOI 1) infected MA104 cell treated with graded concentration of quercetin (1.56 µM, 3.125 µM, 6.25 µM, 12.5 µM, 25 µM, 50 µM, and 100 µM) for 24hpi. IC₅₀ was measured to be 4.36 µM. (B) Stool samples were collected from suckling mice infected with RV and treated either with DMSO or quercetin for 48hrs. Total virus particles were quantified afterwards. Each bar represented mean ± SD of three independent experiments (Unpaired student's t-test, *p< 0.05, **p<0.01). (C) HE staining of small intestinal tissue section of 5 days old mice either uninfected or infected with RV-SA11 in the presence or absence of quercetin (10 mg/kg/day). Scale bars are 10 µM and 30 µM.

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

For effective diagnosis of viral etiology of gastroenteric diseases and to prevent unnecessary antibiotic usage owing to misdiagnosis, a cost-effective multiplex Real time PCR assay was designed for detection of GARV, HAdV-F, NoV GI, NoV GII and RNaseP (internal control). In-house and third-party validation in two non-ICMR laboratories revealed >96% sensitivity and 100% specificity. The kit is in process of technology transfer at ICMR HQ.

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

- 16th Asian Conference on Diarrhoeal Disease and Nutrition (ASCODD 2022) during 11-13 Nov 2022 at The Westin Hotel organized by ICMR-NICED, Kolkata. Oral presentation titled Rotavirus NSP5 functions as a gatekeeper for cytoplasmic replication compartments: Selective access to pro-viral or antiviral host determinants during viral replication.
- 4th training workshop on Biosafety and Biosecurity held at ICMR-NICED on 30th Nov 2022 by NICED-VRDL. Oral Presentation titled Emergency responses in the laboratory and biological waste management.
- International Conference on Virus Evolution, Infection and Disease Control (ICVEIDC) during 15-17 Dec 2022 at Hyderabad University. Oral presentation titled Host-directed anti-virals: Strategy targeting host factors critical for rotavirus infection.
- 30th West Bengal State Science & Technology Congress on 28th Feb-1st Marc 2023 at Science city, organized by WB State Science and Technology. Oral presentation titled titled Importance of Medical Research: Lessons Learnt from COVID 19 Pandemic in the
- 7th Hands-on training workshop on Laboratory Diagnosis of Emerging Viral Diseases on 27-28 Feb 2023 organized by NICED-VRDL lab. Oral presentation titled Viral Diagnostics.

Ph.D. Awarded

Name of the student : Rakesh Sarkar

Title of the thesis : Delineating the role of DNA damage response during rotavirus infection

University : Calcutta University

Date of Award : February 2023

Post and Pre-Doctoral Fellows:

Post-Doctoral Fellow:

Dr Arpita Mukherjee, DHR Women Scientist

Pre-Doctoral Fellow :

Ms Priyanka Saha, SRF- DST Inspire

Ms Shreya Banerjee, SRF-UGC

Mr. Pritam Chandra, SRF-ICMR

Ms Ritubrita Saha, JRF-UGC

Ms. Ranjana Sharma, JRF-CSIR

Ms Suvroto Mitra, Women Scientist -DHR

A. Chakrabarti (Principal Investigator), Virology Division

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

- Vibrio phage reference laboratory is working as a referral center for phage typing study of *V.cholerae* O1 biotype ElTor strains and *V.cholerae* O139 strains over last few decades.
- Samples received from different cholera endemic regions and hospitals in India for characterization and phage typing were initially confirmed as *V.cholerae* O1 biotype ElTor followed by serological identification by using polyvalent O1 and monospecific Inaba and Ogawa antisera.
- Phage typing study was performed using conventional phage typing scheme of Basu and Mukherjee and the new phage typing scheme for discrimination of the cholera isolates.
- This year we have received a total of 163 samples from different cholera endemic regions and hospitals in India for characterization and phage typing analysis. Most of the strains received were identified as *V.cholerae* O1 biotype ElTor, Ogawa.
- Only two phage types were found using the conventional phage typing scheme of Basu and Mukherjee. New phage typing scheme discriminated the strains into several different types. The phage type 27 was found as the predominant type followed by type 25.
- Isolation and characterization of new bacteriophages against *V.cholerae* O1, *Shigella* and *Salmonella* sp is ongoing. New pahges isolated for *V.cholerae* O1 biotype ElTor are under characterization.

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

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

- Influenza A virus develops a strong relationship with its host, reaping the benefits of host-cell proteins for its own ends. E3 ligase TRIM32 ubiquitinates influenza virus polymerase protein, PB1, leading to PB1 protein degradation and limiting viral infection. After protein-kinase- A-catalyzed phosphorylation of TRIM32 at Ser651, 14-3-3 proteins attach to it and stop TRIM32 from auto-ubiquitylating. TRIM32-containing cytoplasmic body formation is a potential auto regulatory mechanism that can reduce the concentration of soluble free TRIM32.
- PB1 gene of Influenza A virus, 14-3-3 η coding sequences, and TRIM32, antiviral host factor was cloned into some of the mammalian expression vectors like PCMV 6A (Flag-tagged) and pcDNA 6B (His tagged) for studying the functional importance of PB1, viral polymerase, rather than its role of polymerization via Co-immunoprecipitation.
- The expression of chaperone Protein 14-3-3 γ 14-3-3 η , 14-3-3 θ , Protein-kinase- A, Trim32, and Phosphorylated Trim32 were observed in western blot analysis with cell lysate samples collected in different time point post viral infection.
- The role of 14-3-3 protein in IAV infection was analyzed by using 14-3-3 protein-protein interaction inhibitor by western blotting.

Future plan: Interaction between chaperone Protein 14-3-3 (acting as a scaffold protein in this pathway) and viral PB1 as well as NS1 protein will be analyzed in detail by co-immunoprecipitation, followed by co-immunoblotting and bioinformatics analysis.

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

Indian Network of Population-Based Surveillance Platforms for Influenza and Other Respiratory Viruses among the Elderly (INSPIRE) was established in 2018 to assess the prevalence and cost of specified respiratory viral illness caused by influenza viruses and RSV among older adults in India.

Within the last one-year time period, we have received a total of 599 samples from the community cohort and tested the samples for detection of Influenza A, Influenza B, and RSV viruses.

Influenza virus positive specimens were further subtyped to influenza A H1N1, AH3N2, Seasonal influenza, influenza B sub lineage Victoria etc.

We have tested 508 CLI-associated samples to detect the presence SARS-CoV-2 and found very high positivity of SARS CoV 2 in the community, 103 (20.7%) samples were found positive for SARS CoV 2.

However positivity rate of influenza was very low compared to other seasons, we found only 4 (0.6%) samples positive for influenza virus.

Probably, prevalence of SARS-CoV-2 and associated restrictions of human movement like lockdown, public awareness, less gathering etc. suppressed the influenza infection during the COVID-19 pandemic time.

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

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

- Attended a national level meeting titled “Research and advocacy for prevention and control of Influenza and other respiratory viruses in India” held between 19th-22nd April 2022, in New Delhi.
- Participated and demonstrated in 5 day training program on “Role of Technology in Community Level Disaster Mitigation for Scientists & Technologists” at the Centre for Disaster Management (CDM), Lal Bahadur Shastri National Academy of Administration (LBSNAA), Mussoorie from 25th to 29th July, 2022.
- Attended a national level meeting titled “Prevention and Control of Influenza and Other Respiratory Viruses for West Zone” during September 2-3, 2022, in Mumbai
- Attended a national level meeting titled “Prevention and Control of Influenza and Other Respiratory Viruses for the South zone” at Chennai from Nov 21st to Nov 22nd, 2022.
- Attended a meeting at North Bengal Medical College, Siliguri, for finalizing the sites of MRHRU between December 8-9, 2022
- Delivered an invited talk “Comparative analysis of PB1-F2 protein from different Influenza A virus subtypes and its role in enhancing viral pathogenicity” in the International Conference on Virus Evolution, Infection and Disease Control (ICVEIDC) at School of Life Sciences, University Of Hyderabad, India during 15-17 December 2022
- Attended a workshop on Foodborne Disease Outbreak Investigation from 1st to 4th February 2023 at ICMR-Headquarters New Delhi
- Delivered lecture “Overview of Viral Diagnostic Techniques” in the 7th Hands-On Training Workshop on Laboratory Diagnosis of Emerging Viral Diseases organized by Regional Virus Research and Diagnostic Laboratory (VRDL), ICMR-NICED during March 15-16.
- Delivered lecture “Cell Culture Techniques – An Overview” in 7th Hands-On Training Workshop On Laboratory Diagnosis Of Emerging Viral Diseases organized by Regional Virus Research and Diagnostic Laboratory (VRDL), ICMR-NICED during March 15-16.

Post and Pre-Doctoral Fellows:***Pre-Doctoral Fellow***

Mr. Devendranath Tewari, SRF-UGC

Ms. Sampurna Biswas, SRF-ICMR

Mr. Partha Pratim Mandal, JRF-UGC

Mr. Sanjoy Biswas, JRF-UGC

Ms. Deborima Chatterjee, 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. The study was sanctioned by ICMR on 20th June 2022 followed by the recruitment of a Research Assistant and a Laboratory Technician, preparation of SOPs, procurement of consumables, and standardization of assays. After ethics approval, sample collection has been started in collaboration with the School of Tropical Medicine, Medical College, and IPGIMER Kolkata. A total of 56 cases were recruited in the first year from the three ART centres of the study. The proportion of the different cases was: 06 ART naïve, 38 on first-line ART, 10 on first-line failure and 02 on second-line failure. A competent phlebotomist collected 2.5 ml of blood and transported it to the HIV Research Laboratory, maintaining cold chain. Plasma was separated, aliquoted, and stored at -70°C for HIV viral load estimation and genotyping. A structured questionnaire was used for clinical case sheets, recording demographic information, HIV-related history, and medical history. Demographic data were recorded in a pre-designed format, and correlations were used to identify drug resistance patterns. After RNA extraction, two rounds of PCR were done using specific primers and optimized thermocycling conditions. Sanger sequencing was done for obtained PCR products using specific primers with the help of BigDye™ Terminator v3.1 Cycle Sequencing Kit. The post-sequencing PCR purification was done using the isopropanol method (in-house developed) and sequenced in an automated genetic analyser system. Currently, the results are being validated with a commercial HIV genotyping method [HIV-1 Genotyping Kit with Integrase (The Applied Biosystems, CA, USA)].

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

Globally, different genotypes of human adenoviruses are associated with outbreaks of acute respiratory infection (ARI) though such evidence is lacking from India. This project was conceived with the aims to identify the circulating and predominant serotypes of human respiratory adenovirus in Eastern India and find if there is any correlation between the HAdV serotype and severity of disease, the prevalence and seasonality of the HAdV, and evaluate HAdV-associated outbreak potential in this region. Among the samples screened during this period, 29.91% (n=1597/5339) were found to be positive for HAdV. Infection occurred throughout the study period although a sharp increase in positivity case has been observed since December 2022. The sudden increase in the positivity of respiratory adenovirus among hospitalized children with ARI from Kolkata and the surrounding districts of West Bengal, India, from December 2022 to date was published in a peer-reviewed journal. A sharp rise in the positivity rate of respiratory adenovirus was found which ranged from 22.1% in early December 2022 to 52.6% in mid-March 2023. The overall positivity was 40.4% during the period and children in the 2 to <5 years (51.0%) age group were mostly affected. Single infection with adenovirus was found in 72.4% of cases while co-infection with rhinovirus was the maximum (9.4%). Around 97.5% of positive cases required hospitalization. Cough, breathlessness, and wheeze were the most common clinical features among positive patients. Phylogenetic analysis of the hexon and fiber gene of all the sequenced strains revealed HAdV-B7/3 recombination with more than 99% homology within themselves. This report of a respiratory adenovirus outbreak in West Bengal, India causing severe illness in the pediatric population underscores the need for regular monitoring of the circulating strains.

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

The Virus Research and Diagnostic Laboratory (VRDL) at ICMR-NICED is a regional laboratory established in 2015 under the auspice of VRDL Network under the 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 46,642 samples were screened at VRDL for more than 30 viruses and other pathogens of public health importance:

Table 3: Number of samples tested at VRDL

Sl. No.	Investigations Performed	Total No. of samples tested from April 2022 to March 2023	Positive Samples	Positivity Rate
1.	Dengue NS1 ELISA	1277	56	4.39
2.	Dengue IgM ELISA	1184	71	6.00
3.	Chikungunya IgM ELISA	347	15	4.32
4.	Chikungunya PCR	8	1	12.50
5.	Zika Virus PCR	1	0	0.00
6.	JE Virus IgM ELISA	63	4	6.35
7.	Hepatitis A IgM ELISA	299	116	38.80
8.	Hepatitis E IgG ELISA	320	21	6.56
9.	Hepatitis B surface Ag ELISA	230	9	3.91
10.	Hepatitis C Ab ELISA	339	6	1.77
11.	Influenza A - H1N1 PCR	5346	357	6.68
12.	Influenza A - H3N2 PCR	5346	39	0.73
13.	Influenza B- Yamagata PCR	5346	0	0.00
14.	Influenza B- Victoria PCR	5346	47	0.86
15.	Respiratory RSV -A PCR	5339	22	0.41
16.	Respiratory RSV -B PCR	5339	370	6.93
17.	Respiratory hmpV A1A2 PCR	5339	218	4.08
18.	Respiratory PIV PCR	5339	399	7.47
19.	Respiratory Adenovirus PCR	5339	1597	29.91
20.	Respiratory Rhinovirus PCR	5339	774	14.50
21.	SARS-CoV-2 PCR	38637	1357	3.51
22.	Scrub typhus IgM ELISA	1059	62	5.85
23.	Leptospira IgM ELISA	384	26	6.77
24.	Monkey Pox PCR	11	0	0.00
25.	VZV PCR	12	7	58.33
26.	HSV PCR	23	2	8.70
27.	Entero Virus PCR	4	0	0.00
Total Testing Done		86924		
Total Samples Received		46642		

A study on nanomaterials-based improved PCR for the detection of SARS-CoV-2 has been completed and LAMP-based detection of *Chlamydia trachomatis* is being evaluated.

Table 4: Regular training programs have been organized as part of capacity building:

Title	Date	Participating institute	No. of participants
4 th Training Workshop on Biosafety and Biosecurity	30 th Nov 2022	ICMR-NICED	60
7 th Hands-on training workshop on Laboratory Diagnosis of Emerging Viral Diseases	27 th - 28 th Feb 2023	VRDLs of West Bengal	09
	15 th - 16 th Mar 2023	VRDLs of West Bengal and Jharkhand	09

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-NICED under this project and the laboratory is now equipped to initiate isolation, antigenic characterization, and gene sequencing of Influenza viruses. A total of 492 severe acute respiratory illness (SARI) and 630 influenza-like illness (ILI) samples were collected from twelve hospitals and four community settings respectively. Validation of the new combo real-time PCR kit to include Influenza, SARS-CoV-2 and RSV which has been developed by NIC at ICMR-NIV Pune has been completed. The project will screen RSV as part of the surveillance on children under 5-years.

Sexually Transmitted Infections among Key Populations in India: A Systematic Review

ICMR-NICED was the primary implementation partner for this activity whereas WHO-India was responsible for overall technical guidance and financial support. A technical resource group (TRG) was formed with several eminent people from the different fields of STIs and Systematic Review. Two consultants were appointed to carry on the work. Under the guidance of PI/Co-PIs, consultants, and the core project team from ICMR-NICED performed evidence synthesis from all the available databases, summarize the findings, and submit the draft reports. A study protocol was developed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines prior to the conduct of this review. The protocol was registered in PROSPERO with the registration number CRD4202357425 and subsequently published in PLOS One.

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

Topic of Trainings/ Conferences/ Seminars/ Webinars etc.	Conducted By	Period	
		From	To
Implementation Roadmap for Pilot Projects of HRGs on Virtual Platform and Bridge Populations	NACO	23 Aug 2022	23 Aug 2022
“Ending AIDS as a Public Health Threat by 2030” Revisiting the Definition	NACO	30 Sep 2022	01 Oct 2022
Asian Conference on Diarrhoeal Disease and Nutrition	ICMR - NICED	11 Nov 2022	13 Nov 2022
Training Workshop for Microbial Genomics & Next Generation Sequencing Informatics	CMC, Vellore	16 Nov 2022	18 Nov 2022
Sakura Science Exchange Program	Okayama University and Japan Science and Technology Agency	07 Dec 2022	27 Dec 2022
ePost Graduate Program in Epidemiology	Indian Institute of Public Health Delhi	03 Jan 2023	31 Dec 2023
Antimicrobial Resistance: Genomic surveillance	ICMR HQ	24 Feb 2023	24 Feb 2023
Prevention of Sexual Harassment of Women at Workplace	Dept. of Personnel and Training	16 Mar 2023	16 Mar 2023
Zonal Stakeholders consultation meeting on Influenza and other respiratory viruses - East Zone	ICMR – NICED, AIIMS New Delhi and CDC	21 Mar 2023	22 Mar 2023
Code of Conduct for Government Employees	Dept. of Personnel and Training	23 Mar 2023	23 Mar 2023

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

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

Dr. Nilanjan Chakraborty (PI)

Objective:

- Isolation and characterization of natural compounds like polysaccharides, terpenoids from some medicinal and edible mushrooms (Fungi)
- Screening of these isolated compounds as anti HCMV in vitro.
- To find out the mechanism of mode action of these compounds against HCMV like DNA polymerase inhibition, inactivation of IE 2 proteins or other enzymes or proteins essential for DNA replication of HCMV

Outcome of the project:

- Pleurotus sp.* and *Lentinus sp.* has been found to be a source of potential antiviral compound with EC_{50} of found 106.75 $\mu\text{g/ml}$ and 113.39 $\mu\text{g/ml}$ on MRC5 cell line as well as 111.84 $\mu\text{g/ml}$ and 124.32 $\mu\text{g/ml}$ on 2F7 cell line respectively. (Table-5)
- In vitro analysis of total extracellular secreted enzyme showed maximum antiviral activity of (EC_{50} - 94.36 $\mu\text{g/ml}$ and 103.75 $\mu\text{g/ml}$) on a specific modulated cell line 2F7 and MRC-5 cell lines respectively. (Fig29)
- Comparative antiviral analysis of extracellular laccase enzyme of lab strain *Pleurotus pulmonarius*; MTCC-1805 (Lab Strain) showed similar antiviral responses by analyzing the expression of immediate early genes (IE-1, UL-54)
- Preliminary understanding by *In-silico* analysis of Laccase enzyme showed three peripheral different docking site with one surface catalytic domain. All such peripheral domains were showed 67 to 73 % active protein-protein interactions to HCMV immediate early responsive proteins such as UL-97 and IE-1. Further molecular simulation studies are under observation and which is currently analyzing with the help of Autodock Vina 4.3.

Table 5:-Cytotoxicity and antiviral activity of the mush extracts as well as Laccase enzyme.

	CC_{50} value*		EC_{50} value*		SI index (CC_{50}/EC_{50}) on MRC5 cell line	SI index (CC_{50}/EC_{50}) on 2F7 cell line
	MRC5**	2F7**	MRC5**	2F7**		
Crude ethanol mushroom extract <i>Pleurotus sp.</i> (PE)	713.35 \pm 3.36	752.65 \pm 2.01	106.75 \pm 1.05	111.84 \pm 0.85	6.68	6.72
Crude ethanol mushroom extract <i>Lentinus sp.</i> (LE)	584.84 \pm 1.15	623.12 \pm 1.60	113.39 \pm 0.96	124.32 \pm 0.86	5.15	5.01
Laccase enzyme extract	655.31 \pm 0.86	647.25 \pm 0.97	103.75 \pm 1.14	94.36 \pm 1.21	6.31	6.86

*All the experiments were done in triplicate

**Mean value of the extract were presented ($\mu\text{g/ml}$) with S.D.M

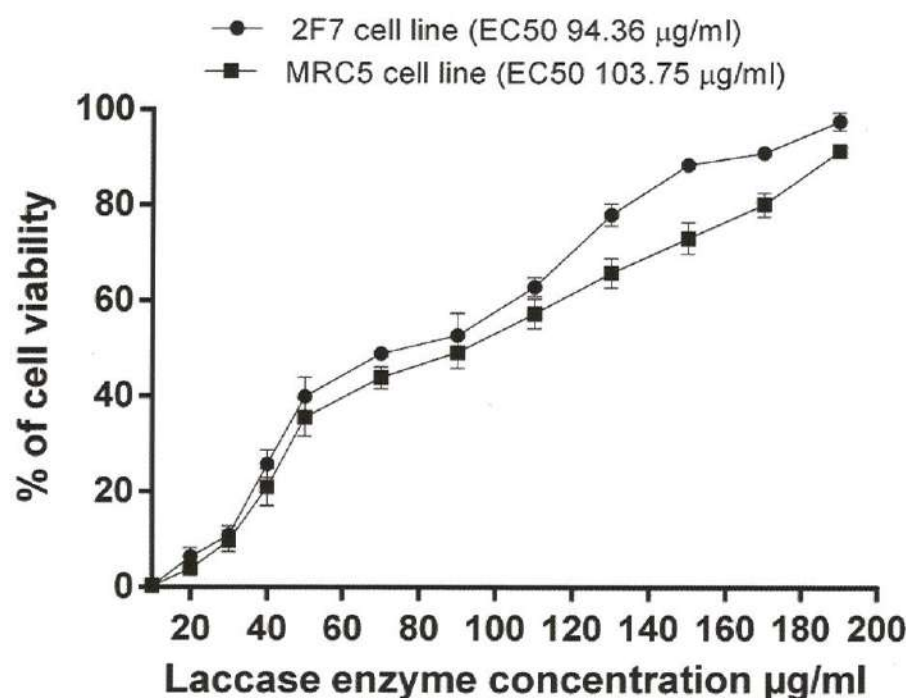


Fig 29: Percentage of cell viability concentration of laccase on MRC5 and 2F7 cell line.

Molecular detection and diagnosis of Human Cytomegalovirus (HCMV) among patients admitted for renal transplant at metropolitan hospitals of Kolkata, West Bengal

Dr. Nilanjan Chakraborty (PI)

Objective:

1. Molecular detection of HCMV infection and characterization of symptoms associated with HCMV viremia among patients undergoing renal transplantation.
2. Estimation of HCMV viral load in these patients and its correlation with disease severity and clinical manifestation.
3. Analysis of different host risk factors (physical, demographic, biochemical, hematological and immunological) associated with HCMV infection among these patients.

Outcome of the study:

- In this study total 52 samples were collected from the organ transplant recipient along with those 52 respective donors of those patients (total 104 samples) based on the presence of ≥ 1 clinical symptoms such as diarrhea, leukopenia, thrombocytopenia, pneumonitis, hepatitis, and other gastrointestinal disease.
- highly symptomatic clinical manifestations had been observed on post renal transplant patients with **lymphoproliferative disorder (PTLD)**[36%], **post-transplant diabetes mellitus**[19%]; and **post-transplant renal artery stenosis**
- Among the post transplant patients 23 recipients were found HCMV IgM positive and 29 recipients were HCMV IgM negative. Subsequently HCMV DNA PCR was performed for all samples where 11 samples (21.15%) were found HCMV DNA PCR positive and 41 recipient samples (78.84 %) were found negative. (Table 6)

Table 6: Comparison of clinical characteristic between HCMV infected Chronic stage renal transplant patients.

		HCMV IgM detection on during chronic stage (Post Transplant)			
Total (n=52)		IgM Positive (n=23)	IgM Negative (n=29)		
Male	34 (65.3%)	16	18		
Female	18 (34.6%)	7	11		
Anti HCMV IgG status before transplantation					
Total (n=52)		IgG positive	IgG Negative		
D+R+	3 (5.76%)	2	1		
D-R+	5 (9.61%)	1	4		
D+R-	4 (7.69%)	3	1		
D-R-	40 (76%)	0	40		
Different Clinical factors associated with Chronic HCMV infection					
	Total (52)	Sero-Positive	Sero-Negative	PCR Positive	PCR Negative
Leukopenia	21	11	10	8	13
Thrombocytopenia	14	9	5	7	7
Pneumonitis	8	3	5	1	7
Hepatitis	6	2	4	0	6
Diarrhea	16	10	6	7	9
Gastrointestinal disease	4	1	3	0	4
lymphoproliferative disorder (PTLD)	19	14	5	11	8
Diabetes mellitus	10	6	4	5	5
Renal artery stenosis	6	4	2	3	3

Problems and challenges in detecting symptomatic congenital and perinatal cytomegalovirus infection among infants in Kolkata, India: A cross-sectional study in a resource-limited condition.

Dr. Nilanjan Chakraborty (PI)

Objective:

1. To diagnose and differentiate the HCMV infection into a congenital and perinatal infection among the infants of day 1 to 365.
2. To identify clinical characteristics of congenital HCMV and perinatal HCMV infection respectively.

Outcome:

- A total of 126 (32.6 %) were CMV positive while 261 (67.4%) were CMV negative. Among the HCMV infected group, 8 (6.3%) were congenital while 118 (93.7%) were perinatally infected infants when tested within 21 days
- However, most of the subjects were recruited late and shows signs of cCMV infection i.e. symptomatic term infants and a more severe form of the disease. Infant and maternal characteristics, and basic lab abnormalities between HCMV positive and negative groups showed no significant differences. However, the chorioretinitis and neonatal cholestasis were significantly different.(Table-7)

Table 7: Comparison of the characteristic clinical symptoms of CMV-positive (n=126) and CMV-negative (n=261) subjects

S. No.	Symptoms	CMV Positive, N n=126	CMV negative, N=261	p-value
Symptoms related to the central nervous system (CNS symptoms)				
1	Choreoretinitis	4 (3.2)	1 (0.4)	0.207
2	Sensorineural hearing loss	4 (3.2)	3 (1.1)	0.724
3	Hydrocephalus	2 (1.6)	1 (0.4)	0.618
4	Microcephaly	15 (11.9)	21 (8.0)	0.497
5	Seizure/ Convulsion	11 (8.7)	32 (12.3)	0.54
6	Cataract	2 (1.6)	2 (0.8)	0.681
7	Ventriculomegaly	0 (0.0)	1 (0.4)	0.626
8	CNS Calcification	5 (4.0)	8 (3.1)	0.724
9	Neurodevelopmental delay	4 (3.2)	9 (3.4)	0.889
Symptoms not related to central nervous system (Non-CNS symptoms)				
1	Neonatal Cholestasis	53 (42.1)	82 (31.4)	0.429
2	Hepatosplenomegaly	52 (41.3)	85 (32.6)	0.511
3	Neonatal hepatitis	7 (5.6)	27 (10.3)	0.436
4	Pneumonia	17 (13.5)	49 (18.8)	0.536
5	Respiratory distress syndrome	13 (10.3)	38 (14.6)	0.545
6	Thrombocytopenia	10 (7.9)	28 (22.2)	0.647
7	IUGR	11 (8.7)	30 (11.5)	0.641
8	Anemia	30 (23.8)	61 (48.41)	0.598
9	Failure to thrive	10 (7.9)	18 (6.9)	0.869
10	Diarrhoea	6 (4.8)	11 (4.2)	0.886
11	Hepatomegaly	47 (37.3)	99 (37.9)	0.905

Data are mentioned as n (%), p-value adjusted for multiple comparisons

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

Dr. Nilanjan Chakraborty (PI)

Objective:

1. Deciphering the diagnostic dilemma among the Dengue negative patients and Chikungunya positive patients in tertiary care hospitals of Kolkata.
2. Epidemiological assessment of circulating Chikungunya strain and prevalence of seasonal CHIKV infections among diverse populations.

Outcome:

- Chikungunya infection was found in 15.1% and 5.3% of the 635 dengue-negative patients, as determined by ELISA and RT-PCR, respectively. Arthritis, myalgia were more common in chikungunya infected patients at the time of hospital admission while conjunctivitis, photosensitivity, body ache, loss of appetite, fatigue, retro-orbital pain, vomiting, rashes, or swollen glands were significantly present as an overlapping symptom.
- Extensive study revealed that many dengue negative patients overlooked and left untreated, but they may have suffered due to CHIKV infection, which is why it is important to identify the actual disease so that patients can get rid of from the mortality and morbidity of CHIKV infection. The demographic

distribution of present chikungunya infections (Fig 30) and comparative assessment of chikungunya RT-PCR and ELISA data on different clinic-physical characters are summarized in the Table 8.

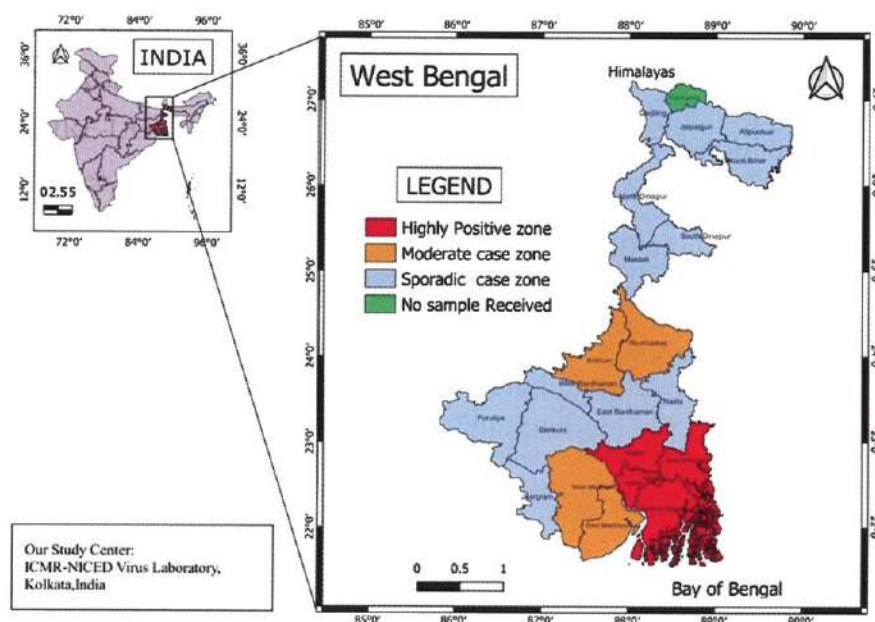


Fig 30: Demographic distribution of chikungunya infections on different district of West Bengal

Table 8: Mean weight, blood sugar level and age of patients based on the RT-PCR and serological detection of CHIKV

Factors	RT-PCR	P Value	ELISA	P value
Weight (Kg)	64 ± 9.7	0.2	63 ± 9.7	0.8
Blood Sugar (mg/dL)	125 ± 23.9	0.5	97 ± 22.3	0.0
Age	46 ± 13.9	0.0	42 ± 13.3	0.5

Surveillance of foodborne disease pathogens from North-East India

Dr. Nilanjan Chakraborty (Co-PI)

Objective:

1. To identify the pathogens causing foodborne diseases and outbreaks.
2. Evaluate the burden of the foodborne disease

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

Outcome:

- In this study, till date 158 samples were received at NICED from North East India for routine diagnosis and outbreak investigation..
- Real time PCR analysis followed by Gastofinder Kit showed various major food borne pathogens such as *Proteus mirabilis*, *Shigella* spp, *Salmonella* spp, *Staphylococcus aureus*, *Citrobacter weckmannii*, *V. cholera*, *Campylobacter* spp. and several strains of Norovirus, Adenovirus and Rotavirus.
- A proper foodborne pathogens repository had been made and monitored the followed strains throughout the year routinely for predicting any disease outbreak in near future.

List Conferences / Seminars /Workshops / Meetings / Trainings Attended (April 2022 to March 2023):

Workshop title- Surveillance of foodborne pathogens from NE India

Dates – 1st – 4th February, 2023

Place- Delhi

Organized by- ICMR Head Quarters

Status of participation- Attended for training

Conference title: Sunderban Kristi Mela Loko Sanskriti Utsab

Dates: 20th – 29th December, 2022

Organized By:

Status of Participation: Attended as a representative of ICMR-NICED Kolkata

Seminar Title: Health Research Seminar

Dates: 21st December, 2022

Place: Kalyani Mahavidyala College

Organized by: Indian Science Congress Association (ISCA), Kolkata Chapter

Status of Participation: Invited as a guest speaker

Presentation Title: Human Cytomegalovirus - a threat barely known to population

Conference Title: 16th Asian Conference on Diarrhoeal Disease and Nutrition (ASCODD)

Dates: 11th -13th November, 2022

Place: Kolkata

Organized By: ICMR-NICED

Status of Presentation: Attended as a representative of ICMR-NICED Kolkata

Ph.D. Awarded

Name of the student : Dr. Aroni Chatterjee

Title of Thesis : Understanding The Molecular Epidemiology and Etiological Attributes of Human Cytomegalovirus (HCMV) Infection in The Context of Different Medico-Clinical Manifestations with Special Focus On the Phylogenetic Variability of the Tegument Genes.

University : University of Calcutta

Date of Degree : September 2022

Post and Pre-Doctoral Fellows

Pre-Doctoral Fellow-

Mr. Sabbir Ansari, SRF-UGC

Mr. Rajendra Prasad Chatterjee, SRF-DBT

Mr. Debsopan Roy, SRF-WBDST

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

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

Principle Investigator: Provash Ch. Sadhukhan

Co-Investigator: Shanta Dutta, Mahaiuddin Ahammed, Partha Chattopadhyay, Arunava Sarkar, Sujay Roy, Prasanta Chaudhary, Shymal Kanti Pal

The generation of viral quasiespecies helps HCV evade host adaptive immunity efficiently. To understand Resistance-Associated Substitutions (RAS) at baseline, amplification and Sanger sequencing of NS3, NS5A, and NS5B genes were done from the plasma of HCV-infected patients. During this study period, 67 patients received and completed Direct Acting Antivirals (DAAs) treatment. Out of them, 55.22% (n=37) and 41.79% (n=28) were prescribed the drug combination of sofosbuvir + velpatasvir and sofosbuvir + daclatasvir respectively. Only two patients had received sofosbuvir + velpatasvir + Ribavirin treatment. Overall, 95.52% (n=64) patients were able to achieve sustainable viral response (SVR) whereas 4.48% (n=3) patients were non-responders against DAAs. The efficacy of the combination of sofosbuvir + velpatasvir and sofosbuvir + daclatasvir was 94.59% (n=35) and 96.43% (n=27) respectively. Of the 3 non-responder patients, 66.66% (n=2) were infected with HCV GT-3a and 33.33% (n=1) were infected with HCV GT-3b.

Resistance-associated amino acid substitutions such as position P189S, N307G, D330E, A356P, R379K, and F586L were found in 60% of the local isolates in the NS5B region of HCV genome. Amino acid substitution K206E (against Sofosbuvir) has also been found in almost 20% of our population. In the NS3 region of HCV genome, resistance-associated amino acid substitutions such as A166S and Y56Y+Q168Q+I/V170I (against Glecapavir, Paritaprevir, and Grazoprevir) have also been found within the local isolates.

Dengue serotyping study

Investigators: Provash C. Sadhukhan and Shanta Dutta

Dengue fever is an acute systemic arboviral disease; transmitted between mosquitos and their human host globally with both endemic and epidemic transmission cycles. India is the global epicenter of dengue, contributing approximately 34% of clinical infections worldwide. Considering the consequences of secondary dengue infection, dengue serotyping is much needed to find the dengue endemic zones. Dengue NS1 seroreactive samples from patients with ≤ 5 days of fever were studied from two referral Hospitals in Kolkata. Viral RNA was extracted from NS1 seroreactive samples and subjected to molecular serotyping, genotyping (for prevalent serotype) and phylogenetic analysis was performed. Demographic data were used to elucidate dengue transmission pattern using GIS analysis. Among RNA positive patients, DENV3 (55%) was observed as the prevalent serotype followed by DENV2 (41%), DENV1 (2%) and DENV4 (2%). Phylogenetic analysis of prevalent serotypes showed Genotype-III of DENV3 whereas Genotype II of DENV2 was the major circulating DENV strain in Kolkata and its suburbs. Spatiotemporal distribution of DENV with GIS and hotspot mapping for risk analysis detected Kolkata as a dengue hotspot.

Major projects undertaken during the year 2022-2023 and their achievements: (April 2022-March 2023)**Title:** Development of HCV antigen-based early detection system**Duration:** 3 years**Funding:** ICMR RA (ITR Innovation Projects)**Investigators:** Dr. Moumita Majumdar and Dr. Provash Ch. Sadhukhan

HCV infection is among the most common transfusion and intravenous transmitted infections in humans. HCV core protein is circulated in blood stream during the virus replication in liver cells. This viral protein is an alternative detection target to NAT based replicating viral genome detection in patients. In India, core antigen-based HCV detection is not commercially available and is very costly even for research use. In this study, our aim is to develop a core antigen-based HCV detection method alternative to NAT assay.

The full-length HCV core gene was amplified by nested RT-PCR from archived HCV RNA isolated from a chronic HCV genotype 3 infected patient. Cloning and expression of HCV Core protein containing His-tag were done. ssDNA aptamers specifically binding to HCV core protein have been identified from a literature survey and validated through molecular simulation. Best-predicted aptamers have been chosen and tagged with gold nanoparticles. After successful tagging, their interactions with HCV core protein have been initiated.

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

- Baskey U, Verma P, Ghosh A, Dutta S, Bakshi S, Das R, Nath S, Dutta S and Sadhukhan PC. Trends in serotypic shift of Dengue virus and its outbreak in West Bengal, India. 15th International Conference on Medical Arthropodology. December 12 – 14, 2022, Hyderabad.
- Verma P, Baskey U, Roychoudhury K, Dutta S, Bakshi S, Das R, Nath S, Mazumdar M, Dutta S and Sadhukhan PC. Dengue the mimicker of COVID-19: An alarming risk of a dual burden on the healthcare system. 15th International Conference on Medical Arthropodology. December 12 – 14, 2022, Hyderabad.
- Dutta S, Das R, Bakshi S, Nath S, Dutta S, Sadhukhan PC. Genomic Diversity of HCV among High risk group population in Darjeeling. 16th ASCODD 2022, Kolkata, Nov 11-13, 2022.
- Verma P, Roychoudhury K, Baskey U, Ghosh A, Dutta S, Bakshi S, Das R, Nath S, Dutta S and Sadhukhan PC. Diarrhea and Gastrointestinal complications associated with dengue virus infection: A proteomic approach to understand their patterns and causes. 16th ASCODD 2022, Kolkata, Nov 11-13, 2022.
- Bakshi S, Dutta S, Das R, Nath S, Verma P, Baskey U, Dutta S and Sadhukhan PC. Unique HCV genotype distribution pattern among two different high-risk groups population in West Bengal, India. 16th ASCODD 2022, Kolkata, Nov 11-13, 2022.

Seminar (2022-2023)

- A short Meeting on Nanobiotechnology organized by Amity Institute of Nanotechnology and Amity Institute of Biotechnology. January 25, 2023

Workshops and webinars (2022-2023):

- Hands-on workshop on Next-generation Sequencing-organized by NICED at 16th ASCODD, on 12th November, 2022, Kolkata. (Sagnik Balshi)
- Hands-on workshop on MALDI TOF/TOF and imaging organized by IIT-Kharagpur on 29th December 2022, Kharagpur, West Bengal. (Priya Verma, Shreyasi Nath, Anwesha Ghosh)

- Online webinar on “Effective scientific writing workshop: Techniques and strategies for communicating research findings” conducted by Nano-Science and technology consortium, 1st-3rd February, 2023. (Shreyasi Nath, Anwesha Ghosh)
- Understanding the basics of environmental AMR for national action. Antimicrobial Resistance in the Environment Webinar Series. Organized by the Food and Agriculture Organization of the United Nation, UN Environmental Programme, WHO and World Organization for Animal Health. June 14, 2022.

Post and Pre-doctoral Fellows

Post-doctoral fellow:

Dr. Moumita Mazumdar, Project Research Associate

Pre-doctoral fellow:

Mr. Supradip Dutta, SRF-UGC

Ms. Upasana Baskey, SRF-UGC

Ms. Priya Verma, SRF-UGC

Mr. Sagnik Bakshi, SRF-Project

Ms. Raina Das, SRF-Project

Ms. Shreyashi Nath, SRF-CSIR

Ms. Anwesha Ghosh, JRF-UGC

SERVICES PROVIDED BY THE INSTITUTE

NABL Accreditation

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

COVID-19 testing and reporting

Being a regional centre, Virus Research and Diagnostic Laboratory (VRDL-NICED) was one of the first 13 VRDLs in the network to get activated and initiate routine testing of SARS-CoV-2 besides NIV, Pune and NCDC, New Delhi. Currently, it is dedicated to testing samples referred directly from the hospitals and other healthcare centres/camps of Kolkata and the different districts of West Bengal. An average turnaround time of less than 24 hours is maintained for every sample received at the laboratory. Over 38 thousand samples have been tested during 2022-23. A BSL2+ facility was commissioned in 2020 housing the high throughput Roche COBAS 8800 at ICMR-NICED to keep up with increasing testing demands in West Bengal. The system was utilized for timely testing utilizing minimum manpower and uploading of results in ICMR portal along with quick communication to the referring centres, maintaining minimum turnaround time.

Table 1: Diagnostic services of Regional VRDL (other than COVID-19):

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

NRAMRB received 31 *Escherichia coli* and 40 *Klebsiella pneumoniae* from PGIMER, Chandigarh. Antimicrobial susceptibility testing using VITEK-2-compact system, antimicrobial resistance gene profiling and detection of virulence genes was carried out by PCR for the *E. coli* and *K. pneumoniae* strains. AMR gene detection by PCR was also done for 49 *A. baumannii* and 90 *P. aeruginosa* strains. NRAMRB 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 is currently functional at the repository for whole genome sequencing and analysis of the strains.

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-NICED is engaged in Quality assurance of HIV, HBV & HCV diagnostic kit, which is routed through Consortium secretariat, ICMR-NARI, Pune.

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

Table 2: Kit Evaluation by Consortium of NRLs, ICMR-NICED, Kolkata (April 2022 to March 2023):

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	09	09	09	09	09
HIV RAPID	53	53	46	53	46
HBsAg ELISA	04	04	03	03	03
HBsAg RAPID	01	01	01	01	01
HCV ELISA	04	04	03	03	03
HCV RAPID	05	05	00	05	00
TOTAL	76	76	62	74	62

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

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

Table 3: External Quality Assurance/ Confirmation of samples from SRLs/ NRLs (From April 2022 to March 2023)

Sl. No.	Source of Samples	No. of sample Tested	No. of sample Positive	Indeterminate at NRL
1.	SRL- NEIGRIHMS, Shillong	01	NIL	01
2.	SRL-Silchar MCH, silchar, Assam	01	01	NIL

Table 4: Referral Service done for the institutions at NACO NRL, ICMR-NICED, Kolkata (From April 2022 to March 2023)

Sl. No.	Source of Samples	No. of sample Tested	No. of sample Positive
1.	Command Hospital (EC), Kolkata	01	01
2.	ICTC, ICMR-NICED	03	03

Table 5: HIV Sentinel Surveillance 2023 (ANC and Prison): NRL, ICMR-NICED (Testing Lab.), Kolkata (sample received and tested from January 2023 to March 2023)

Name of the site (Type)	Site code with subsite	Samples received	Samples rejected	Samples tested	Result (Reactive)		
					HIV	Hep B	Hep C
Abinash Dutta Maternity Home (ANC)	19335012-0	396	Nil	341	Nil	01	Nil
Jangipur Sub-Divisional Hospital (ANC)	19325021-0	400	Nil	391	01	03	Nil
Nabadwip State General Hospital (ANC)	19328011-0	401	Nil	333	Nil	01	Nil
Vidyasagar State General Hospital (ANC)	19335021-0	401	Nil	369	Nil	Nil	Nil
Aranghata BPHC (ANC)	19328012-1	202	Nil	202	01	01	01
Ranaghat Sub-Divisional Hospital (ANC)	19328012-2	200	Nil	200	Nil	01	Nil
Madhyamgram Rural Hospital (ANC)	19329021-1	186	Nil	153	Nil	Nil	01
Barasat Medical college & Hospital (ANC)	19329021-2	201	01	201	Nil	Nil	Nil
Berhampore Central Correctional Home (Prison)	19325131-0	278	Nil	240	Nil	10	02

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

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

Table 6: HIV testing details at ICTC, ICMR-NICED (April 2022- March 2023)

Total Tested	Positive	Positivity	HIV-TB Infection	Co-	Client Tested	initiated	Provider Tested	Initiated
680	11	1.6%	1		368		312	

Table 7: HBsAg, HCV, VDRL testing details in ICTC, ICMR-NICED (April 2022-March 2023)

Tests	HbsAg	HCV	VDRL
Total Tested	288	289	19
Total Positive	01	04	02

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

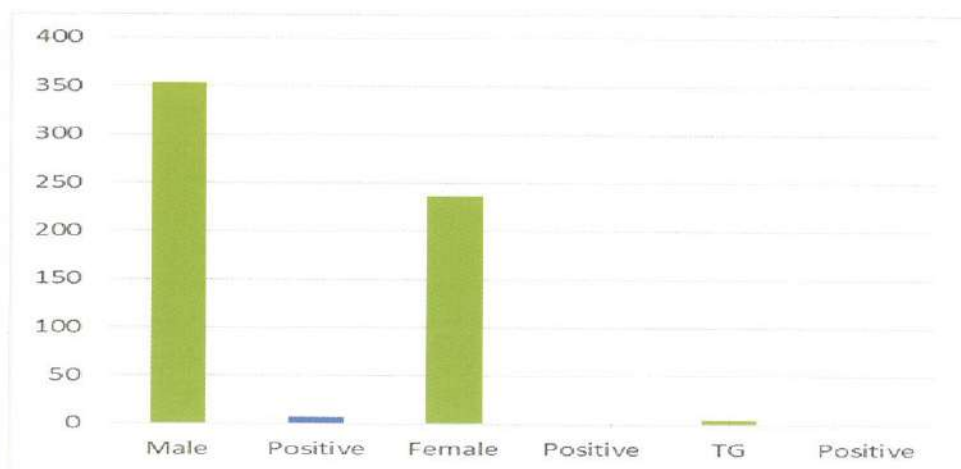


Fig 1: From April 2022 to March 2023 total 680 clients were tested for HIV in ICTC. Among them 11 were found positive (Figure: 1). All the HIV positive clients were linked to ART center, STI clinics and NTEP for further treatment and care. HIV negative clients were also linked to STI centre and NTEP if required.

Early Infant Diagnosis (EID)

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

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

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

A total of 3979 DBS samples were received from April 2022 to March 2023 at ICMR-NICED-Regional Reference Laboratory (Molecular HIV Lab) and among them 3979 samples were accepted for testing, according to sample acceptance criteria. A total of 3626 DBS samples were tested for the period of 01.04.2022 to 28.03.2023 (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 8: Status of EID DBS Sample Accepted and Tested (with Positivity of HIV-1) at ICMR-NICED from the period April 2022 to March 2023

Name of States	No. of DBS Samples Accepted	No. of DBS Samples Tested	No. of HIV-1 DNA Detected DBS Samples
West Bengal	484	444	17
Odisha	247	240	5
Chhattisgarh	809	749	42
Bihar	901	797	53
Jharkhand	193	173	18
Mizoram	368	328	10
Assam	222	192	10
Manipur	134	122	11
Nagaland	275	243	18
Meghalaya	285	285	36
Arunachal Pradesh	7	5	0
Sikkim	4	4	0
Tripura	47	41	6
A & N Islands	3	3	0
TOTAL	3979	3626	226

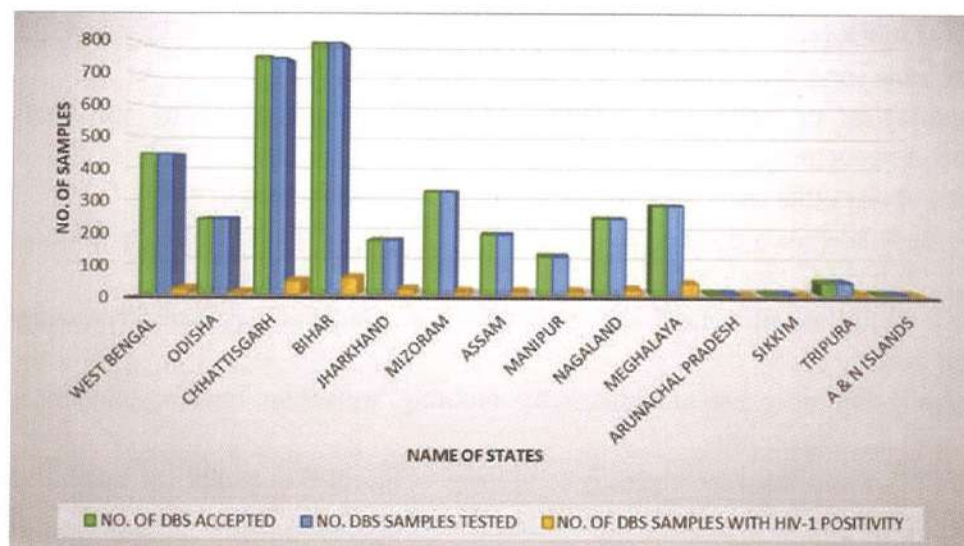


Fig 2: State wise EID DBS Sample Accepted and Tested and Reactivity status for the period April 2022 to March 2023:

Regional Institute (East) for HIV Sentinel Surveillance

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

Spectrum of activities of Regional Institute:

- Implementation and support to Surveillance and Epidemiology activities on community based integrated bio-behavioural surveillance among general population, community based integrated bio-behavioural surveillance among HRG, bridge population and PLHIV; STI surveillance, incidence surveillance, mortality surveillance, population size estimation, programme and case-based surveillance and epidemiological investigations in the states of A&N Islands, Chhattisgarh, Meghalaya, Nagaland, Sikkim & West Bengal.
- Technical support & guidance to State AIDS Control Societies (SACS) in overall planning & implementation of HIV surveillance activities in eastern & north-eastern states of India, facilitating smooth implementation of surveillance & epidemiological activities by liaising with the concerned state authorities and addressing specific problems at sentinel sites/ testing laboratories.
- Technical Validation & approval of new sites through review of relevant data & site visits.
- Conduction of Regional Pre & Post-surveillance co-ordination & planning meetings, Regional Trainings and Workshops for HIV Surveillance.
- Technical & Supervisory support for state level training of site personnel & lab personnel.
- Monitoring & Supervision during HSS through site visits by RI team members.
- Constitution of State Surveillance Teams (SST) and coordination of all their activities including Monitoring & Supervision by SST members.
- Ensuring timely reporting & corrective action at sites/testing labs during the surveillance round.
- Data Entry, matching, modifying, freezing & cleaning through Strategic Information Management System.

- Concurrent data monitoring and initiation of corrective action, as and when required.
- Guide SACS in preparation of state surveillance reports after the surveillance round.
- Undertaking special epidemiological or operational studies and in-depth analyses during the inter-surveillance period to validate or strengthen surveillance findings.
- Technical review and approval of any other specific proposal from SACS related to HSS.
- Submission of report of activities undertaken during surveillance and analysis of the surveillance findings in the allocated states.
- Technical support to NACO to further strengthen the surveillance & epidemiology activities under National AIDS Control Programme.
- Support NACO in the organization of consultation/capacity building workshop on surveillance & epidemiology activity.
- Regional Institute, ICMR-NICED was given responsibility to prepare technical framework for Integrated Biological & Behavioural Surveillance (IBBS) which will be implemented during 2023-2030. IBBS will be implemented in the country among various high-risk populations like Female Sex Workers (FSW), Men who have Sex with Men (MSM), Injecting Drug Users (IDU) & Hijra/Transgender (H/TG) and bridge population (Clients of FSWs).

Table 9: ANC Sites in ICMR-NICED region for HSS Plus 2023

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

Table 10: Prison Sites in ICMR-NICED region for HSS Plus 2023

States	No. of Sites	Samples Allotted
Chhattisgarh	4	1600
Meghalaya	1	400
Nagaland	1	400
West Bengal	3	1200

Training, Workshop and Meetings:

- National Pre Surveillance Meeting was held on 12th & 13th October 2022 at New Delhi. RI Project Coordinator & Research Officers attended the meeting.

- Regional Training of Trainers for eastern region was organized by RI and held at ICMR-NICED during 23rd -25th November 2022. Participating states were Andaman & Nicobar Islands, Chhattisgarh, Meghalaya, Nagaland, Sikkim & West Bengal. State Surveillance Team (SST) members, officials from State AIDS Control Society (SACS) from the above mentioned states and NACO Officials attended the training program.
- State level training (ANC round) of site personnel of West Bengal was organized in two batches. One in Kolkata on 8th – 9th December 2022 and one in Siliguri on 15th – 16th December 2022. Prison Site personnel training for West Bengal was held during 27th – 28th January 2023 at Kolkata. RI team members attended all the training programs as resource person.
- Site personnel training of Chhattisgarh was organized in three batches during 19th – 24th December 2022 at Raipur. HSS training for prison sites of Chhattisgarh was held during 3rd & 4th February 2023 at Raipur. RI Focal person, RI team members and SST members attended both the training program as resource person.
- State level training for Andaman & Nicobar Islands was organized on 27th – 28th December 2022 at Port Blair. RI project coordinator and SST member attended the training program as resource person.
- ANC Site personnel training for Nagaland was held at Kohima during 10th & 11th January 2023 and Prison site personnel training for Nagaland was held during 24th – 25th January 2023 at Dimapur. RI team members and SST members from Nagaland attended the training as resource person.
- State level training of ANC surveillance of Meghalaya was organized in two batches during 10th - 12th January 2023 and Prison site personnel training for Meghalaya was held during 12th – 13th January 2023 at Shillong. RI Project Coordinator and SST members attended the training program as resource person.
- State level training of ANC site personnel of Sikkim was held on 16th & 17th January 2023 at Gangtok. RI project Coordinator and SST members attended the training program as resource person.
- HSS laboratory personnel training for NICED region was organized by RI and held on 20th January 2023 in virtual platform. Laboratory In-Charges, Technical officers and laboratory technicians from HSS testing labs attended the training program.

In-Vitro Diagnostic Kit Performance Verification

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

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

The kit evaluation committee conducted meetings in developing the administrative & technical guidelines, budget, SOPs, etc. for kit evaluation as per CDSCO guidelines. The activity generated 2,50,000/- for one request through kit evaluation and 75,000/- for three requests through ILQC for Influenza during the year.

Influenza Diagnostics:

Provided diagnostics for influenza and other respiratory viruses to community

Phage typing of *V.cholerae* O1:

Provided service to the nation on phage typing of *V.cholerae* O1 biotype ElTor strains.

During this year of report we have received a total of 163 samples from different cholera endemic regions and hospitals in India for characterization and phage typing analysis. All the strains were characterized by phage typing using a panel of typing phages available at the Vibrio Phage Reference Laboratory. Most of the strains received were identified as *V.cholerae* O1 biotype ElTor, Ogawa and were discriminated into two different types using the conventional phage typing scheme of Basu and Mukherjee. However, new phage typing scheme discriminated the strains into several types.

Gastrointestinal Tract Pathogens Repository (GTPR):

GTPR facility is working actively in receiving strains for characterization and storage for future research purpose from different laboratories across the country. Diagnostic test results received from the Microbiology division were communicated to the concerned sender of the strains by this facility.

Involvement in covid-19 pandemic and SARS-CoV-2 research work:

- **CRISPER based diagnosis of Covid-19 using paper microfluidics:**

Efforts are ongoing to develop quick diagnostics for COVID-19. We were awarded with a fund from DBT-BIRAC in collaboration with IIT- Guwahati and IIT-Jammu to develop a CRISPR based diagnostics. The objectives of the current year was Real-Time RT-PCR analysis of viral gene target and development of RT-LAMP assay with cross validations to develop a CRISPR-CAS system for COVID-19 diagnosis.

Full length RNase P, M gene and N gene of SARS-CoV-2 were cloned in pCDNA6B vector.

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

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

As a designated centre, ICMR-National Institute of Cholera & Enteric Diseases, has collected and stored the Nasopharyngeal & Oropharyngeal swabs, Serum, Plasma, Stool, Urine, Sputum and Bronchioalveolar Lavage from confirmed Covid-19 positive patients after obtaining the consent of patients or their respective family members. We have preserved a total number of 1438 Swab, 519 Plasma, 493 Serum, 162 Stool, and 245 Urine, 93 Sputum samples from 348 total participants (345- Cross Sectional and 3- Follow up participants) and preserved the aliquots of different samples as per the guideline mentioned in the respective SOPs. We have stored all of the samples as mentioned above in our repository.

FLAGSHIP PROGRAMMES - SWACHH BHARAT CAMPAIGN

The activities of ICMR-NICED under the Swachhta Action Plan during the period April 2022 to March 2023 included Swachhta Awareness Campaign among the slum dwellers and owners and consumers of several roadside eateries, public seminars as well as observation of Swachhta Pakhwada as directed by the concerned ministry. Due to COVID-19 related restrictions, school-based activities were conducted in limited number of schools during this period. A brief account of the activities is mentioned below.

Swachhta Programmes in the Communities:

ICMR-NICED organized several community-based programmes to promote Swachhta-related awareness and practices among the community members. The ICMR-NICED team members discussed about safe water as well as safer foods, especially for the children. They also stressed upon keeping their households and surrounding clean and garbage free and encouraged the community members to undertake voluntary cleanliness drives within their localities. They also visited several roadside eateries to convey food, hand and personal hygiene related matters. Through interactive question and answer sessions in each of these events, the participants were made aware of prevention and management of many common illnesses including diarrhea, hepatitis, typhoid fever, and various mosquito borne diseases.

Table 11: Swachhta awareness campaigns in the communities

Date	Venue	Participants
June 30, 2022	Slum area at 6 No. Ram Mohan Garden Lane, East Kolkata, KMC ward no. 33	22 adults and 14 children
July 27, 2022	95/H/2/1 Beliaghata Main Road, Kolkata 700 010	10 children and 25 adults
August 26, 2022	3 No. Ghor Bibi Lane, Kolkata-700 054	11 children and 22 adults
September 30, 2022	Ashutosh Shastri Road, Beliaghata, Kolkata-700010	16 adults
October 31, 2022	Roadside eateries near ICMR-NICED, beside Subhas Sarabor Park, KMC Ward No.33 Kolkata-700 010	Shop owners and customers of two roadside eateries
November 25, 2022	Haatgachiya, KMC Ward No.58, Kolkata	Twelve number of mother and 10 under-5 children
December 21, 2022	Kultali Milan Tirtha Society Ground, Basanti, 24-PGS (S)	53 women and 24 children

Glimpses of community-based activities:



Swachhta Programmes in the schools:

ICMR-NICED organized three school-based programmes to promote Swachhta-related awareness and practices among the school children and teachers. The ICMR-NICED 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 12: Swachhta awareness campaigns in the schools

Date	Venue	Participants
January 20, 2023	Shree Jawahar Hindi Vidyalaya, 77A/ Beliaghata Main Road, Kolkata- 700 010	17 girls and 18 boys of class five students
February 22, 2023	Shree Harijan Vidyalaya, 100/H, Suren Sarkar Road, Kolkata-700 010	2 class teachers and sixteen students of class V
March 27, 2023	KMC Primary School, P-35. 36 C.I.T. Scheme-IV M, Kolkata- 700 010	23 students of class V and the Head Mistress

Glimpses of school-based activities:

Special Swachhta Drives by ICMR-NICED:

Programmes under Swachhta Pakhwada (April 1 – 15, 2022)

(A) Display of Swachhta Message on ICMR-NICED Website: Messages related to Swachhta Issues were scrolled continuously on ICMR-NICED Website during the period of SwachhtaPakhwada (Apr 1-15, 2022)

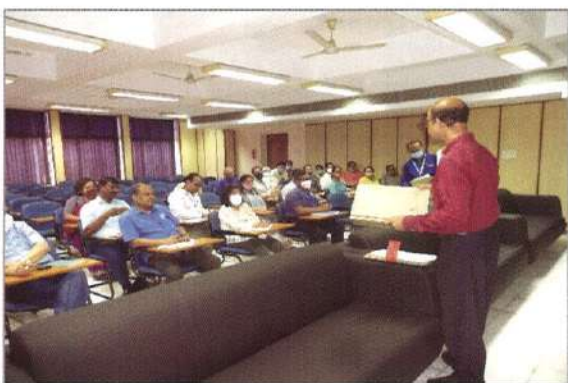
(B) Swachhta Awareness Campaign Outside ICMR-NICED Campus: A team of scientists and members of Swachh Bharat Committee of ICMR–NICED conducted a voluntary cleaning activity near Subhas Sarobar on April 01, 2022 to create awareness and promote hygienic practices among the people around the area. The team members also interacted with the passer byes regarding maintenance of personal hygiene, food and water safety, and environmental sanitation including proper waste disposal.



(C) Swachhta Pledge Taking Ceremony: A Swachhta Pledge taking ceremony was organized by ICMR-NICED on April 04, 2022. The event was attended by all scientists, staff and students of ICMR-NICED who took the pledge in Hindi, English and Bengali.



(D) e-Office Training for Scientists and Technical Staff: Transition from paper-based to digital filing and office transaction systems is an important step towards implementation of Swachhta Campaign. Thus, ICMR-NICED organized two e-Office training workshops for its staff. The first workshop was conducted by Dr. R.K. Nandy for the scientists and technical staff of the institute on April 05, 2022.



(E) Cleaning Activity Within NICED-I Building Campus: ICMR-NICED conducted a voluntary cleaning activity within the premises of NICED-I building on April 06, 2022. This activity was led by the Director, ICMR-NICED 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.



(F) Celebration of World Health Day, 2022: As per the Swachhta Pakhwada action plan, ICMR-NICED organized a popular lecture on the occasion of World Health Day, 2022 within the Institute on 7th April, 2022. The event was attended and thoroughly enjoyed by the scientists, staff and students of ICMR-NICED. In the inaugural speech, Dr. Amit Pal, Scientist-F, ICMR-NICED elaborated on the theme of World Health Day, 2022- "Our Planet, Our Health", with special emphasis on COVID-19 pandemic. He then introduced the speaker Dr. Kunal Kanti Majumdar, Prof. and Head, Department of Community Medicine, KPC Medical College and Hospital, Kolkata. Dr. Majumdar spoke on "Arsenic Contamination of Ground Water and Its Impact on Health". His lecture was followed by an interactive session with the audience.



(G) Popular Lecture on Infection Control During COVID-19 Era: As part of observation of Swachhta Pakhwada (April 1-15, 2022), a popular lecture was delivered by Dr. Swati Pramanik, DADHS, Swasthya Bhavan, Govt. of West Bengal "Infection Control in Hospitals and Households during COVID-19 era". The lecture was organized on April 12, 2022 at ICMR-NICED. The event was enjoyed by the scientists, staff and students of ICMR-NICED and included a series of interesting interactions.



TRAINING & EXTENSION

A. Important Meetings held at ICMR-NICED

50th Scientific Advisory Committee (SAC) meeting of ICMR-NICED, Kolkata held on 6-7th September, 2022 in presence of Experts, Director and Scientists of NICED



B. Visit of Scientists / Scientific Staff /Academicians

Lecture/ session Title	Date	Invited scientists/ Academicians
“Introduction to Infectious Disease Modelling”	14th July, 2022 (Thursday)	Ms. Deborah Mary Shackleton, PhD Researcher, Centre for Water Systems, University of Exeter, UK,”
“Stomach Viruses: hide in salivary glands and transmit through Saliva”	19th August, 2022	Dr Sourish Ghosh, Senior Scientist, IICB Kolkata
“Effects of spaceflight on Biological Systems”	25th November, 2022	Dr.Sharmila Bhattacharya, Senior Program Scientist for Space Biology, NASA, USA,
“Principles of resolving and non resolving inflammation “	5th January, 2023	Dr.Sourav Ghosh, Associate Professor, Department of Neurology and Pharmacology, Yale University School of Medicine, USA
“Introduction of Osaka University”.		Prof. Tetsuya Iida, Research Institute for Microbial Diseases, Osaka
“Automated Analysis Pipeline for Nanopore Sequencing– Identification of Non-Tuberculous Mycobacteria”		Shota Nakamura, Associate. Professor, Research Institute for Microbial Diseases, Osaka University
“Structural Analysis based on X-ray crystallography and Cryo-EM”		Dr.Hiroya Oki, Research Fellow, Research Institute for Microbial Diseases, Osaka University

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

- i. As a regional laboratory with a mandate of capacity building, regular hands-on training on laboratory detection of Emerging Viral Diseases and SARS-CoV-2 by RT-PCR were organized by VRDL-NICED to impart trainings to healthcare professionals from other VRDLs of West Bengal and Jharkhand.

Title	Date	Place	Organized by	Participating institute	No. of participants
7 th Hands-on training workshop on Laboratory Diagnosis of Emerging Viral Diseases	27 th - 28 th Feb 2023	Regional VRDL	Regional VRDL	VRDLs of West Bengal	09
	15 th - 16 th Mar 2023			VRDLs of West Bengal and Jharkhand	09

- ii. On behalf of the Biosafety committee, one workshop on 'Biosafety and Biosecurity' was organized by VRDL-NICED for the laboratory personnel of the institute.

Title	Date	Place	Organized by	Participating institute	No. of participants
4 th Training Workshop on Biosafety and Biosecurity	30 th Nov 2022	ICMR-NICED Seminar Hall	Regional VRDL	ICMR-NICED	60

ICMR-NICED observed the Swachhata Pakhwara from 1- 5 April 2022. Under the above program, swachhata pledge was taken on 4th April 2022 in English, Hindi and Bengali by all scientific, technical and ministerial staff, respectively under the leadership of the Dr. Shanta Dutta, Director, Mr. T. S. Gopakumar, Administrative Officer and Dr. Sandip Mukhopadhyay, Scientist-E, ICMR-NICED. Dr. Alok Kumar Deb, Scientist- F delivered the vote of thanks. All the scientists, administrative, technical staff participated in the activity with good enthusiasm.



Under the above program, swachhata pledge was taken on 4th April 2022 in English, Hindi and Bengali by all scientific, technical and ministerial staff, respectively under the leadership of the Dr. Shanta Dutta, Director, Mr. T. S. Gopakumar, Administrative Officer and Dr. Sandip Mukhopadhyay, Scientist-E, ICMR-NICED.

Dr. Alok Kumar Deb, Scientist- F delivered the vote of thanks. All the scientists, administrative, technical staff participated in the activity with good enthusiasm.



Observation of #World Health Day at ICMR-NICED on 7th April, 2022. Prof (Dr.) Kunal Kanti Majumdar, Professor and HOD, Community Medicine, KPC Medical College, Kolkata and an eminent Public Health Expert delivered a lecture around this year's theme of "Our Planet, Our Health" on the topic "Arsenic Contamination of Ground Water and Its Impact on Health" where he efficiently and interactively presented multiple facets and possible directions towards management and mitigation of chronic arsenicosis. All the scientific, administrative, technical & project staff, students participated in the programme and made it successful.



ABP Ananda Shiksha Samman 2022: Dr. Shanta Dutta, Director on behalf of ICMR-National Institute of Cholera and Enteric Diseases received ABP Ananda Shiksha Samman 2022 at Swabhumii on 10th June, 2022



ICMR-NICED celebrated the World Blood Donor Day on 14th June, 2022. In this occasion a Voluntary Blood Donation Camp was organized by ICMR-NICED in collaboration with RBTC, NRS Medical College & Hospital, Kolkata. Following welcome address by Dr.Shanta Dutta, Director, ICMR-NICED, a Pledge for Blood Donation was taken. Scientists, staff, research scholars and students of ICMR-NICED participated in the program, voluntarily donated blood with enthusiasm and made the event successful.



On the countdown program of the 8th International Day of Yoga (IDY) 2022, ICMR-NICED celebrated 'Yogotsav' on 16th June 2022. Following welcome address by Dr. Shanta Dutta, Director, ICMR- NICED, Mr. Pallab Dasgupta, Yoga and Physiotherapy Specialist, Pallab's Yoga Institute, Kolkata demonstrated and guided 'Common Yoga Practice' and 'Yoga Break Practice'. All the staff and students participated by practicing yoga and made the programme successful.



International Day of Yoga 2022 was celebrated at ICMR-National Institute of Cholera & Enteric Diseases on 21st June, 2022. The event started with welcome address by Dr Amit Paul, Scientist G, ICMR-NICED. Mr. Pallab Dasgupta, Yogacharya delivered a popular lecture on Yoga. The team of youngsters from 'Pallab Yoga Institute' made the audience spellbound with fantastic demonstration of their Yoga skills and some awe-inspiring stunts of Yoga. The event ended with vote of thanks.



Ms. Deborah Mary Shackleton, PhD Researcher, Centre for Water Systems, University of Exeter, UK, delivered a lecture on "Introduction to Infectious Disease Modelling" on 14th July, 2022 (Thursday) at the Seminar Room of ICMR-NICED II building.



One-day training program cum workshop was arranged at ICMR-NICED, Kolkata for the BHMS students (29th Batch) of the National Institute of Homeopathy, Kolkata on 27 July, 2022. About 80 final year students have participated in this training program. The students were welcomed with an opening address delivered by the Director, NICED followed by a brief introductory lecture to the attendees. A series of educational lectures were delivered by the scientists of ICMR-NICED, which are as follows-

- Bacterial etiological agents of Diarrhoea
- Parasitological etiological agents of Diarrhoea
- Viral etiological agents of Diarrhoea
- Biosafety in the laboratory and bioethics in clinical research
- Animal Model in Biological Research

The lab tour and hands on session took place after the lunch. Students in few groups have visited various laboratories of ICMR-NICED for practical demonstration of research techniques. The program was ended successfully.





In connection with HIV Sentinel Surveillance activities, a consultation meeting on database design for Integrated Bio-Behavioural Surveillance (IBBS) was held on 28-29th July, 2022 at ICMR-NICED. The meeting was organized by Regional Institute (East) for HIV Surveillance, ICMR-NICED. Dr. Shanta Dutta, Director, ICMR-NICED; Mr. Elangovan A, Scientist-G, ICMR-NIE; officials from RI AIIMS-New Delhi, RI ICMR-NIE, RI ICMR-NARI, RI PGIMER-Chandigarh, RI RIMS-Imphal, RI ICMR-NICED and Dr. Pradeep Kumar, National Consultant, National AIDS Control Organization participated in the meeting.



1st Technical Resource Group (TRG) meeting on the project entitled 'Sexually Transmitted Infections among key population in India : A Systematic Review' funded by WHO-India was held during 11-12th August 2022 at ICMR-NICED, Kolkata. Experts from WHO-India; NEIGRIHMS Meghalaya; Independent STI consultant; Campbell South Asia, New Delhi; Gauhati Medical College & Hospital, Assam; ICMR-National Institute of Epidemiology (NIE), Institute of Serology, Kolkata and Durbar Mahila Samanwaya Committee, Kolkata participated the meeting.



Celebration of 76th Independence Day of India at ICMR-NICED, Kolkata. Director, Staff and their family members participated in the flag hoisting ceremony at 11.00 a.m. on 15th August, 2022 at the premises of NICED-1 building. Following hoisting of National Flag and inaugural address by Dr. Shanta Dutta, Director, ICMR-NICED, a few other staff expressed their views on the importance of the Independence Day in our day to day life followed by patriotic cultural programme. National Anthem was sung by the staff at the end of the program.



Dr Sourish Ghosh, Senior Scientist, IICB Kolkata, delivered a talk on “Stomach Viruses: hide in salivary glands and transmit through Saliva” at 3:30 PM on 19th August, 2022 at the Seminar Room of NICED-II building.



हिंदी पखवाड़ा 2022

आई.सी.एम.आर- राष्ट्रीय कॉलरा एवं आंत्ररोग संस्थान में 12 सितम्बर, 2022 को हिन्दी पखवाड़ा का समापन समारोह का आयोजन किया गया। निदेशक की अध्यक्षता में कार्यक्रम के मुख्य अतिथि वक्ता डॉ अमित कुमार दीक्षित, सहायक निदेशक, केंद्रीय आयुर्वेद अनुसंधान संस्थान, आयुष मंत्रालय भारत सरकार, कोलकाता, ने “राजभाषा कार्यान्वयन की कठिनाइयाँ और समाधान” विषय पर वक्तव्य दिया। इस अवसर पर मुख्य अतिथि वक्ता, संस्थान के वरिष्ठ वैज्ञानिक, और कार्यकारी अध्यक्षने आयोजित हुई तीनों प्रतियोगिताओं के प्रतिभागियों को पुरस्कार वितरित किया। कार्यालय के वैज्ञानिक-गण, अधिकारियों और कर्मचारियों की सकारात्मक उपस्थिती ने कार्यक्रम को सार्थक एवं सफल बनाया।

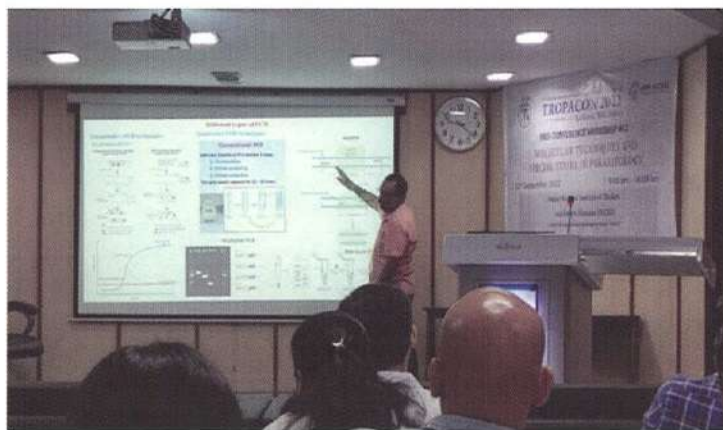


आई.सी.एम.आर-राष्ट्रीय कॉलरा और आंत्र रोग संस्थान, कोलकाता में 1 सितंबर से 14 सितंबर, 2022 तक हिंदी पखवाड़ा का आयोजन किया गया है। 1 सितंबर को संस्थान के निदेशक की उपस्थिति में डॉ कृष्णकुमार श्रीवास्तव, एसोसिएट प्रोफेसर, आसनसोल गर्ल्स कॉलेज ने " भाषा के जनो मुख सरोकार विषयपर बहुत प्रभावी और सारगर्भित व्याख्यान दिया। कार्यालय के कुछ कर्मचारियों द्वारा सांस्कृतिक कार्यक्रम भी किया गया। कार्यक्रम में संस्थान के वैज्ञानिकों, अधिकारियों एवं कर्मचारियों ने भाग लिया। कार्यक्रम में प्रशासनिक अधिकारी ने धन्यवादज्ञापन किया और आगामी कार्यक्रम की सूचना दी।





The pre-conference workshop for TROPACON-2022 entitled “Molecular techniques and special staining in Parasitology”, took place at ICMR-NICED on 22/09/2022. Director ICMR-NICED has presided over the programme. Medical faculties across different states of India have participated in this hands-on workshop at Division of Parasitology. Different techniques for identification of parasites were shown.





The 2nd and Final Technical Resource Group (TRG) meeting on the project entitled ‘Sexually Transmitted Infections among key population in India: A Systematic Review’ funded by WHO-India, was held during 22-23 September, 2022 at ICMR-NICED, Kolkata. Experts from WHO-India; UNDP India; ICMR-National Institute of Epidemiology (NIE), Institute of Serology, Kolkata and Durbar MahilaSamanwaya Committee, Kolkata participated the meeting.



ICMR-NICED observed #Vigilance AwarenessWeek by taking the integrity pledge on 31st October 2022 in harmony with ICMR headquarter through virtual platform in Hindi and English. ICMR- NICED has also observed #National Unity Day on the same day through a Pledge Ceremony virtually with ICMR Headquarter. National Unity pledge was taken in Hindi, English and Bengali by all scientific, technical and ministerial staff, under the leadership of Dr. Shanta Dutta, Director, ICMR-NICED. Banners of Vigilance Awareness Week and National Unity Day were displayed in all buildings of ICMR-NICED.



ICMR-NICED observed #VigilanceAwarenessWeek (26 October to 1st November 2022). Inaugural program was initiated on 26th October 2022 with the Welcome address by Dr. Amit Pal, Vigilance Officer, ICMR-NICED. Next a lecture competition on “Corruption free India for a developed Nation” was organized where many staff and students of ICMR-NICED actively participated and made the event successful. Banners containing the theme of the Vigilance Awareness Week 2022 in Hindi and English were displayed in all buildings of ICMR-NICED.





ICMR-NICED observed #Vigilance Awareness Week on 1st November 2022. Dr. Pawan Kumar Maurya, Scientist-B, ICMR-Centre for Aging and Mental Health, Kolkata provide a deliberation on “Measures to Control Corruption”. Patriotic Cultural Program on Integrity and Unity was organized by the staff and students of ICMR-NICED. All Scientists, technical, administrative, project staff and students participated and made the event successful.



ICMR-NICED observed closing ceremony of #VigilanceAwarenessWeek2022 on 4th November 2022. Following inaugural address, winner of the lecture competition held on 26.10.2022 was declared and subsequently winner gave a deliberation on “Corruption free India for a developed nation” Next an open discussion on “Measures to Control Corruption” was held by the staff of ICMR- NICED. All Scientists, technical, administrative, project staff and students actively participated and made the event successful. Banners containing the theme of the Vigilance Awareness Week 2022 in Hindi and English were displayed in all buildings of ICMR-NICED.



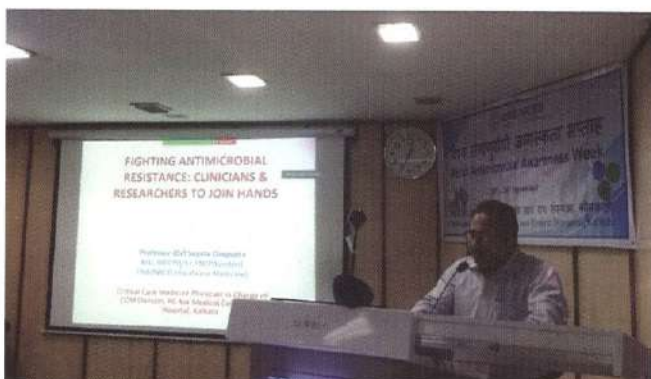


The 16th Asian Conference of Diarrhoeal Disease and Nutrition (ASCODD 2022) was organized during 11-13 Nov, 2022 at Kolkata by ICMR-National Institute of Cholera and Enteric Diseases, Kolkata. Dr. Bharati Pravin Pawar, Hon'ble Minister of State for Health & Family Welfare of India, has kindly inaugurated the program on 11 Nov, 2022. The theme of the conference was "Prevention and control of Cholera, Typhoid and other enteric diseases in low and middle-income countries through community participation". Approx. 450 delegates across India and abroad participated in the conference and made the event successful. The participants were happy by exchanging ideas, knowledge sharing and developing collaborative activities.





ICMR-NICED observed World Antimicrobial Awareness Week (18-24 November, 2022). A program was organized on 24th November 2022 at ICMR-NICED in tune with this year's theme "Preventing Antimicrobial Resistance Together". Following welcome address by Dr. Shanta Dutta, Director, ICMR-NICED, Prof (Dr.) Sugata Dasgupta, Professor and In-charge of Critical Care Medicine, RG Kar Medical College, Kolkata delivered a talk on "Rising AMR problem; how clinician and researchers can join hands in order to address it". Next Prof (Dr.) T. Jawahar Abraham, Professor (Fishery Microbiology) West Bengal University of Animal and Fishery Sciences, Kolkata, presented on "Antimicrobial Resistance in Aquaculture." All the scientific, administrative, technical & project staff, students participated in the programme and made it successful.



Dr. Sharmila Bhattacharya, Senior Program Scientist for Space Biology, NASA, USA, deliver a talk on "Effects of spaceflight on Biological Systems" on 25th November, 2022 at the Seminar Room of NICED-II building.



Regional Training of Trainers for HIV Sentinel Surveillance (HSS) Plus-2023 was held during 23-25th November, 2022 at ICMR-NICED. This training was organized by Regional Institute (East) for HSS, ICMR-NICED for the states of A&N Islands, Chhattisgarh, Meghalaya, Nagaland, Sikkim and West Bengal. Director & other Scientists of ICMR-NICED, HSS Focal persons & other officials from State AIDS Control Societies, State surveillance Team members from the above-mentioned states, official from NACO and RI team members participated in the training.



ICMR-NICED observed Constitution Day on 26th November, 2022 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- NICED.



The 4th Training Workshop on Biosafety and Biosecurity was organized by Regional VRDL, ICMR-NICED on 30th November 2022. The program included lecture sessions on Biosafety and Biosecurity, Emergency responses in the Laboratory, Emerging and Re-emerging high-risk pathogens, Biomedical Waste management guidelines and Fire Safety and hands-on demonstration of Hand washing, PPE donning and doffing, spill management, triple layer packaging and BSL2+ and BSL3 practices. Around 60 participants from different laboratories of ICMR-NICED attended the workshop and made this training program fruitful.





World AIDS Day was observed at ICMR-NICED, Kolkata on 1st December, 2022. In line with this year's theme, ICMR-NICED organized the program with special focus on "Equalize". Dr. Shanta Dutta, Director, ICMR-NICED inaugurated the program with her welcome address. Guest speaker, Dr. D.N. Goswami, Prof, IPGIMER and SSKM Hospital, Kolkata, delivered a talk on "HIV/AIDS: Where we are?", Dr. Santosh Giri, Director of Kolkata Rista, a transgender community-based organisation, delivered speech on equality for Transgender. A dance drama 'AlorDisha' depicting fight against stigma was performed by Nataraj Dance Group, run by transgender people. The program ended with an excellent dance performance by Arindam Sarkar, President of Rista. The program ended with Vote of Thanks by AO, NICED. Scientists, technical, administrative and project staff and students participated in the program to make the event successful.



An awareness program was held at ICMR-NICED to sensitize staffs and students on safety of women in workplace. Mrs. Soma Roy Karmakar from CSR section of the Amplo Global Inc. who actively works on gender discrimination, child abuse and incest, delivered a talk on the theme women safety security and empowerment. She enlightened the audience about POSH act and also highlighted the role of ICC. Scientists, staffs, project staffs and students attended the program. The program ended with vote of thanks.



Mr. Nanda Singh, Senior Research Fellow, Division of Pathophysiology, ICMR-NICED, delivered a talk on "Anti-cancer activity of subtilisin isolated from *Bacillus amyloliquefaciens*" on 8th December, 2022 at the Seminar Room of NICED-II building



A seminar on National Cybersecurity Awareness Program was arranged at ICMR-NICED, Kolkata as per directives received from ICMR HQ. Dr. Saibal Sarkar, Deputy Director General of NIC, Kolkata has delivered a talk on "Cybersecurity and Cyberhygiene" on 09/12/2022. He has shared several examples from his professional experience about the various forms of cyber attacks and their preventive mechanism. The talk was very helpful in managing various cybersecurity issues on regular basis.



Mr. Rakesh Sarkar, Senior Research Fellow, Division of Virology, ICMR-NICED, delivered a talk on "Snatching the good and breaking the bad: turning of the cellular orchestra in favour of rotavirus replication" at 3.00 pm on 22nd December, 2022 at the Seminar Room of NICED-II building.



On behalf of Indian Council of Medical Research (ICMR), ICMR- NICED participated in the Sundarban Kristi Mela O Lokosanskrite Utsab 2022 (20th -29th December, 2022) organized by KultaliMilonTirtha Society at Kultali, Basanti, South 24 Parganas, West Bengal. The participation of ICMR in this Mela was a part of ICMR's effort to focus on major activities of public health importance at the grassroots level and enhance awareness about common health problems among the rural people. The ICMR pavilion was decorated with high quality scientific Posters depicting activities, achievements and contributions of the ICMR Institutes including ICMR – NICED towards Health Research and National Health Programmes such as step towards elimination of Kala azar, LF, Covaxin trial, battle against COVID -19 Pandemic, Establishment of National Antimicrobial Resistance Hub, new innovations on Enteric disease research, mobile stroke unit etc. The presentation by ICMR received overwhelming response and appreciation by a large number of visitors as seen from the footfall in the stall.



Dr.Sourav Ghosh, Associate Professor, Department of Neurology and Pharmacology, Yale University School of Medicine, USA delivered a talk on “Principles of resolving and non resolving inflammation “on 5th January, 2023 at Scientific Forum Seminar series of ICMR- NICED. His enthralling talk was followed by a brainstorming interaction with Scientists, Research Fellows, and PG students who attended the seminar.



Mr. Mainak Chakraborty, Senior Research Fellow, Division of Immunology, ICMR-NICED delivered a talk on "Effects of prenatal exposure to Arsenic on the immune and gastrointestinal function: a study in mice model" at 3.00 pm on 12th January, 2023 at the Seminar Room of NICED-II building.



Celebration of 74th Republic Day of India at ICMR-NICED, Kolkata. Director, Staff and their family members participated in the flag hoisting ceremony at 11.00 a.m. on 26th January, 2023 at the premises of NICED-1 building. Following hoisting of National Flag and inaugural address by Dr. Shanta Dutta, Director, ICMR- NICED, a few other staff expressed their views on the importance of the Republic Day in our day to day life. National Anthem was sung by the staff at the end of the program.



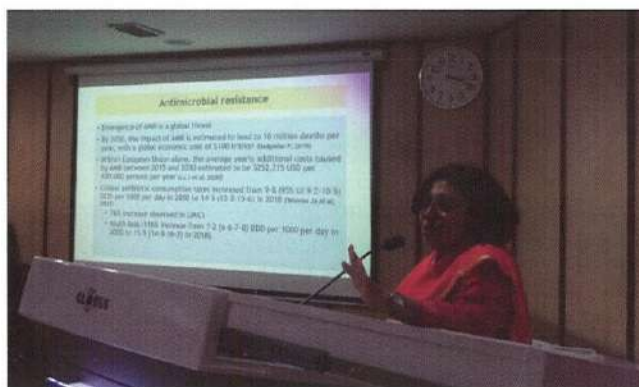
Dr. Moumita Bhaumik, Scientist C, Division of Immunology, ICMR-NICED, delivered a talk on "Twain's tryst: The tale of two cytokines in inflammation" Seminar of ICMR-NICED on 2nd February, 2023. Her talk was followed by brainstorming interaction with the audience. Scientists, Research Fellows and students attended the seminar and made it successful.



Dr. Rajiv Bahl, Secretary, Dept of Health Research and Director General, Indian Council of Medical Research, visited ICMR-NICED on 07.02.2023 for Strategic Review meeting of the Institute. Dr. Shanta Dutta, Director, ICMR-NICED welcomed and felicitated DG, ICMR and presented the glorious history of ICMR-NICED with future plans of key research initiatives. Divisional heads and other scientists presented their priority areas of research with future initiative. Dr. Bahl congratulated all the scientists for their quality research and suggested collaborative implementation research in three priority areas identified by the institute.



Dr. Falguni Debnath, Scientist D, Division of Epidemiology, ICMR-NICED delivered a talk on “Trend of antimicrobial resistance research in past two decades: Global & Indian reflection” on 9th February, 2023. Her talk was followed by brainstorming interaction with the audience. Scientists, Research Fellows and students attended the seminar and made it successful.



Prof. Tetsuya Iida, Research Institute for Microbial Diseases, Osaka University delivered a talk on “Introduction of Osaka University”. Then Shota Nakamura, Associate Professor, Research Institute for Microbial Diseases, Osaka University presented on “Automated Analysis Pipeline for Nanopore Sequencing”.

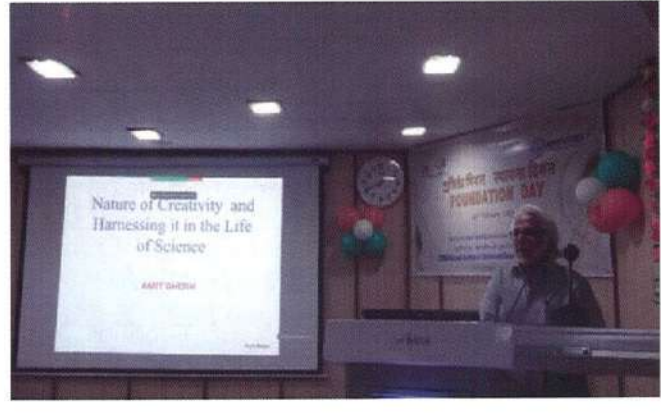
Identification of Non-Tuberculous Mycobacteria". Next Dr.Hiroya Oki, Research Fellow, Research Institute for Microbial Diseases, Osaka University discussed on "Structural Analysis based on X-ray crystallography and Cryo-EM" Their talks were followed by brainstorming interaction with the audience. Scientists, Research Fellows and students attended the seminar and made it successful.



The 61st Foundation Day (18.02.2023) of ICMR-NICED was celebrated on 24.02.2023. Following inaugural song by staff & students, Dr.Shanta Dutta, Director, ICMR-NICED, in her welcome address mentioned the glorious journey and evolution of this institute over the years. Following lighting of ceremonial lamp, Prof (Dr.) Debashis Bhattacharya, Director of Medical Education, Dept of Health & Family Welfare, Govt of West Bengal, Chief Guest and Prof (Dr.) Suhrita Paul, Vice-Chancellor, The West Bengal University of Health Sciences, Special Guest addressed the august audience. Next release of ICMR-NICED Coffee Table Book took place. Prof. (Dr.) Amit Ghosh, Emeritus-ICMR, Vice President (Publications), INSA and former Director, IMT, Chandigarh, being the Guest of Honour delivered the ICMR-NICED Foundation Day Oration 2023 on "Nature of Creativity and Harnessing it in the Life in Science". Employees completing 25 years' service were felicitated. The program ended with Cultural Program by Staff and Students, certificate distribution to the participants of Graffiti competition and playing of National Anthem. Exhibition of paintings by staff and students was also arranged within the premises

A Walk by NICED Staff - Stay fit was organized from NICED-II building to NICED-I building in the evening. All scientists, regular and project staff, pensioners and students participated in the ceremony to make the event successful.



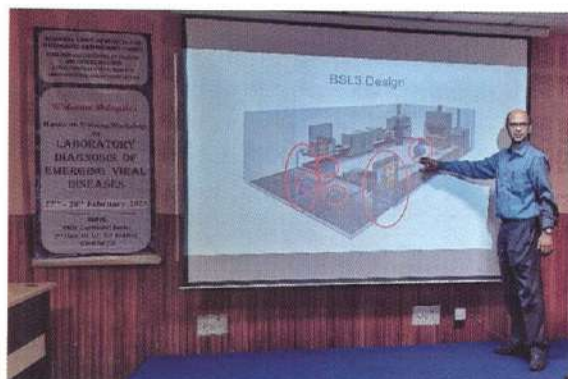




National Science Day 2023 was observed at ICMR-NICED on 28th February 2023. The theme of this year was "Global Science for Global Wellbeing". Prof. (Dr.) Arup Kumar Kundu, Ex-Professor of Medicine & In-charge, Division of Rheumatology, NRS, RG Kar, KPC, IQ City Medical College, graced the occasion as Chief Guest and delivered a popular lecture on "Relevance of Clinical Science in Present Day Scenario". 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.



The 7th Hands on Training Workshop on 'Laboratory Diagnosis of Emerging Viral Diseases' was conducted by Regional Virus Research Diagnostic Laboratory (VRDL), ICMR-National Institute of Cholera and Enteric Disease, Kolkata on 27th and 28th February 2023. The workshop was arranged with a vision to realize the ultimate aim of the VRDL network that is to strengthen the infrastructure of viral diagnosis in India. The program included lecture on epidemiology of emerging viral infections, overview of viral diagnostic techniques, sample collection, receiving, labelling, aliquoting, packaging, transport, working principle of ELISA, Biosafety and Biosecurity, Quality Control and Quality Assurance, working principle of nucleic acid extraction, PCR and Real Time PCR and cell culture techniques. Hands-on demonstration was given on triple layer packaging, ELISA technique, nucleic acid extraction, conventional PCR, Real time PCR and cell culture technique. Nine participants attended the training workshop from five medical college level VRDLs of West Bengal.





Ms. Suparna Chakraborty, Senior Research Fellow, Division of Clinical Medicine, ICMR-NICED delivered a talk on "A mucosal approach for combating enteric infection" on 2nd March 2023. Her talk was followed by brainstorming interaction with the audience. Scientists, Research Fellows and students attended the seminar and made it successful.



ICMR-NICED celebrated International women's day on 9th March, 2023. On this occasion Dr. Dhriti Banerjee, the first woman Director of Zoological Survey of India was invited to share her life experiences to reach this position. She narrated her journey of her life in very entertaining and mesmerizing way which set an example to the woman scientists of our institute. Dr. Paromita Ray, Associate Professor, Dept of Psychiatry, IPGMER and Dr. Sayanti Ghosh, HOD Department of Psychiatry, Murshidabad Medical College briefly discussed on factors inducing stress amongst working woman and the measures to overcome them. The session was interactive where staffs asked questions to the experts and cleared their doubts.





Two days of hands-on training on eOffice was organized for all staff members of ICMR-NICED during March 9-10, 2023. The objective of the training was to provide face-to-face training followed by configuration/implementation of e-office (e-file) related queries/demos for the Administrative, Technical (working at Administration), and Scientific & Technical (TA & above) staff of this Institute. 74 staff members including the Scientists undertook the training. The training helped the attendees to get used to file management and the leave management system



Dr. Moumita Majumdar, ICMR-RA, Division of Virus Laboratory, ICMR-NICED delivered a talk on "Exploration of natural products and bio-conjugated nanoparticle against bacterial biofilm" on 16th March 2023. Her talk was followed by brainstorming interaction with the audience. Scientists, Research Fellows and students attended the seminar and made it successful.



The 2nd phase of the 7th Hands-on Training Workshop on 'Laboratory Diagnosis of Emerging Viral Diseases' was conducted by the Regional Virus Research Diagnostic Laboratory (VRDL), ICMR-National Institute of Cholera and Enteric Disease, Kolkata on 15-16th March 2023. The program included lectures on the epidemiology of emerging viral infections, an overview of viral diagnostic techniques, sample collection, receiving, labelling, aliquoting, packaging, transport, working principle of ELISA, Biosafety and Biosecurity, Quality Control and Quality Assurance, working principle of nucleic acid extraction, PCR and Real-Time PCR and cell culture techniques. The hands-on demonstration was given on the ELISA technique, nucleic acid extraction, conventional PCR, Real-time PCR and cell culture technique. Nine participants attended the training workshop from four medical college-level VRDLs of West Bengal and Jharkhand.



As part of “AzadiKaAmritMohatsav” a health and wellness campaign was conducted by ICMR-NICED on 29/03/2023. On this occasion Swami Suparnananda Maharaj, Secretary, Ramkrishna Mission Institute of Culture, Golpark, Kolkata was invited to deliver a talk on “Spiritual health and well-being”. Through his talk he enlightened the scientists, staffs and students on the power of mind and how one should nourish them. He explained to all the importance of a healthy mind in “karmayog”. The session ended with a vote of thanks to the speakers and the audience.



EXTRAMURAL PROJECTS

- Project Title : A Prospective, Multicentre, Randomized, Active-controlled, Observer-blind, Phase II study seamlessly followed by a Phase III study to evaluate the Safety, Tolerability and Immunogenicity of the candidate GEMCOVAC19 (COVID-19 vaccine) in healthy subject
- Name of PI : Dr. Shanta Dutta, Director and Scientist G
- Names of CoI /CoPI/ collaborators with name of collaborating institute(s) : Dr. Suman Kanungo, Scientist F
Dr. Alok Kumar Chakrabarti, Scientist E
Dr. Agniva Majumdar, Scientist C
- Funding Agency : Gennova Pharmaceuticals
- Period : 2021 – 2023
-
- Project Title : Setting up of Nation-wide Network of Laboratories for Managing Epidemics and National Calamities (VRDL)
- Name of PI : Dr. Shanta Dutta
- Names of CoI /CoPI/ collaborators with name of collaborating institute(s) : Dr. Agniva Majumdar,
Dr. Mamta C. Sarkar,
Dr. Provash C. Sadhukhan
- Funding Agency : DHR/ICMR
- Period : 2014 - continuing
-
- Project Title : Sexually Transmitted Infections among Key Populations in India: A Systematic Review
- Name of PI : Dr. Shanta Dutta
- Names of CoI /CoPI/ collaborators with name of collaborating institute(s) : Dr. Agniva Majumdar,
Dr. Debjit Chakraborty,
Dr. Subrata Biswas
Dr. Mihir Bhatta
- Funding Agency : WHO India
- Period : 2022-2022
-
- Project Title : National Repository of Antimicrobial Resistant Bacteria (NRAMRB): a facility under the “AMR Hub” for addressing AMR research across India
- Name of PI : Dr. Shanta Dutta
- Names of CoI /CoPI/ collaborators with name of collaborating institute(s) : Dr. Sulagna Basu,
Dr. Agniva Majumdar (Nodal person),
Dr. Surajit Basak,

Dr. Debjit Chakraborty,
Dr. Asish K. Mukhopadhyay,
Dr. Ranjan K. Nandy

- Funding Agency : 2021 - continuing
- Project Title : Pan India Epidemiological, Virological and Genomic Surveillance for Human Influenza and COVID-19 through DHR-ICMR VRDL Network
- Name of PI : Dr. Shanta Dutta
- Names of CoI /CoPI/ collaborators with name of collaborating institute(s) : Dr. Agniva Majumdar, Scientist C
- Funding Agency : DHR/ICMR
- Period : 2020 - continuing
- Project Title : A novel therapeutic approach to kill cancer cells by microbial protease mediated degradation of microtubule
- Name of PI : Dr Amit Pal, Scientist G
- Names of CoI /CoPI/ collaborators with name of collaborating institute(s) : Dr. Sushmita Bhattacharya, Scientist B
- Funding Agency : ICMR
- Period : 01.04.2021 to 31.03.2024
- Project Title : Differential Pathogenesis in Giardia: Role of Giardia Virus
- Name of PI : Dr. Sandipan Ganguly, Scientist F
- Names of CoI /CoPI/collaborators with name of collaborating institute(s) : Dr. Yumiko Nakano Saito, Sr. Research Scientist, National Institute of Infectious Diseases, Japan
- Funding Agency : National Institute of Infectious Diseases, Japan
- Period : 2020 to 2021
- Project Title : Identification and Molecular Characterization of Common Enteric Parasites in Kolkata with Special Reference to *Entamoeba* spp.
- Name of PI : Dr. Sandipan Ganguly, Scientist F
- Funding Agency : Indian Council of Medical Research, New Delhi

- Period : 2017 to 2022
- Project Title : Detection of Common Enteric Parasites in Kolkata and Characterisation of the Pathogenic Factors of Local Isolates of *Giardia lamblia*
- Name of PI : Dr. Sandipan Ganguly, Scientist F
- Funding Agency : Indian Council of Medical Research, New Delhi
- Period : 2017 to 2022
- Project Title : Isolation, Identification and Molecular Characterisation of Pathogenic Factors of *Giardia lamblia*
- Name of PI : Dr. Sandipan Ganguly, Scientist F
- Funding Agency : CSIR, New Delhi
- Period : 2017 to 2022
- Project Title : Isolation and purification of a Novel Antiparasitic Compound from Natural Medicinal Source
- Name of PI : Dr. Sandipan Ganguly, Scientist F
- Funding Agency : CSIR, New Delhi
- Period : 2018 to 2023
- Project Title : Human pulmonary Paragonimiasis in crab eating communities and smear negative suspected TB cases from some states of India.
- Name of PI : Dr. Shanta Dutta, Scientist G & Director
- Names of CoI /CoPI/ Collaborators with name of collaborating institute(s) : Dr. Sandipan Ganguly, Scientist F
Indian Council of Medical Research, New Delhi
- Funding Agency : Indian Council of Medical Research, New Delhi
- Period : 2018 to 2023
- 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- NICED
- Names of CoI /CoPI/ collaborators with name of collaborating : Moumita Bhaumik. Sc C, ICMR-NICED

institute(s)

Funding Agency : DST SERB-Power

Period : 2022-2025

Project Title : Cutting the host aids: Studying mechanistic of host cellular determinants that are usurped by rotaviral viroplasmic proteins to design novel antiviral therapeutics

Name of PI : Mamta Chawla Sarkar, ICMR NICED

Names of CoI /CoPI/ collaborators with name of collaborating institute(s) : Moumita Dutta , ICMR-NICED

Funding Agency : ICMR

Period : 2020- 2023

Project Title : Coupling virus-host interaction to host subcellular quantitative proteomics: An unbiased integrated approach to decipher host determinants for rotaviral infection

Name of PI : Mamta Chawla-Sarkar

Names of CoI /CoPI / collaborators with name of collaborating institute(s) : Nabendu S Chatterjee, ICMR-NICED

Funding Agency : WB-DST

Period : 2018-2022

Project Title : Bacterial etiology, antimicrobial susceptibility, resistance determinants in gram negative bacteria isolated from intensive care units in Agartala: Focusing transmissible carbapenem and colistin resistance

Name of PI : Dr. Tapan Majumdar (AGMC, Tripura)
Dr. Sulagna Basu (ICMR-NICED)

Names of CoI /CoPI/ collaborators with name of collaborating institute(s): Dr. Pradip Bhowmik, Dr. Sanjib Kr. Debbarma,
Dr. Debasish Barman (AGMC & GBPH)
Dr. Harpreet Kaur, ICMR Headquarters, New Delhi

Funding Agency : ICMR

Period : 2019-2023

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 (NIV, Pune)
- Names of CoI /CoPI/ collaborators with name of collaborating institute(s): : Co-PI- Dr. Sulagna Basu (ICMR-NICED)
CoI- Dr. Rajlaksmi Vishwanathan, Dr. K. Alagarasu, Dr. Sarah Cherian (NIV, Pune)
CoI- Dr. Sandip Mukhopadhyay (ICMR-NICED)
- Funding Agency : ICMR
- Period : 2023-2026
- 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-NICED)
- Names of CoI /CoPI/ collaborators with name of collaborating institute(s): : Co-PI- Dr. Dipanjan Ghosh (NIPER, Kolkata)
- Funding Agency : ICMR
- Period : 2023-2026
- Project Title : Surveillance of foodborne disease pathogens from North-East India
- Name of PI : Dr. T. Ramamurty
- Names of CoI /CoPI / collaborators with name of collaborating institute(s): : Dr. Nilanjan Chakraborty (Scientist- F), ICMR-NICED Virus Research Laboratory
- Funding Agency : ICMR Task Force Project
- Period : 2021 to 2024
- Project Title : Development of a vaccine against *Helicobacter pylori* based on immunogen formulated from circulating prevalent strains
- Name of PI : Dr. Hemanta Koley
- Names of CoI /CoPI/collaborators with name of collaborating institute(s): : Dr. Asish Kumar Mukhopadhyay
- 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 : Strengthening/Promoting evidence based advocacy for influenza prevention and control in India (INSPIRE - II)
- Name of PI : Dr. Suman Kanungo, Scientist F
- Names of CoI /CoPI/ collaborators with name of collaborating institute(s) : Dr. Alok Kumar Chakrabarti, Scientist E
- Funding Agency : All India Institute of Medical Sciences, New Delhi in collaboration with Centre for Disease Control and Prevention, Atlanta, USA
- Period : 2018- ongoing
- Project Title : Immune response to precautionary third dose of COVISHIELD/ COVAXIN among healthy adult population: an ICMR Cohort study, India
- Name of PI : Dr. Suman Kanungo, Scientist F
- Names of CoI /CoPI/ collaborators with name of collaborating institute(s) : Dr. Shanta Dutta, Director and Scientist G
Dr. Alok Kumar Chakrabarti, Scientist E
Dr. Shubarna Chakraborty, Scientist B
- Funding Agency : Indian Council of Medical Research
- Period : 2022 - ongoing
- Project Title : Studies on HCV drug resistance in HCV-infected patients in the Eastern part of India
- Name of PI : Dr. Provash C. Sadhukhan
- Funding Agency : ICMR Extramural
- Period : 2019-2022 (1-year extension)
- Project Title : Studies on vascular endothelial dysfunction molecules in dengue virus infection: in search of an early potential biomarker for DHF/DSS
- Name of PI : Dr. Provash C. Sadhukhan

Names of CoI /CoPI/ collaborators : Dr. Shanta Dutta
with name of collaborating
institute(s)

Funding Agency : ICMR Extramural

Period : 2020-2023

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

Name of PI : Dr. Falguni Debnath, Dr. Debjit Chakraborty

Names of CoI /CoPI/ collaborators : Dr. Shanta Dutta, Dr. Agniva Majumdar, Dr. Alok Kumar Deb,
with name of collaborating Dr. Sandip Mukhopadhyay, Dr. Sulagna Basu, Dr. Ashish k
institute(s) Mukhopadhyay
Collaborated with Dept of Health & Family Welfare, Govt of
West Bengal
Major Collaborators: Dr. Dipankar Maji
Prof (Dr) Munmun Das Sarkar
Mr. Palash Mondal

Funding Agency : ICMR

Period : 1st August 2022 to 31st July 2025.

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

Name of PI : Dr. Debjit Chakraborty

Names of CoI /CoPI/ collaborators : Dr. Shanta Dutta, Dr. Agniva Majumdar, Dr. Falguni Debnath,
with name of collaborating Dr. Atreyi Chakrabarti
institute(s) Collaborated with District Health Authority , S24 Pargana

Funding Agency : ICMR

Period : 01.11.2021 to 30.06.2022

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

Name of PI : Dr. Moumita Dutta

Funding Agency : DST-SERB POWER Grant

Period : 13th July 2021-12th July 2024

Project Title : Efficacy of newly isolated lytic *Shigella* phage cocktails on
Shigella flexneri planktonic cultures and biofilms

Name of PI	: Dr. Moumita Dutta
Funding Agency	: ICMR DIA Adhoc
Period	: 1 st February 2023-31 st January 2026
Project Title	: Computational molecular modelling and interaction study between ACE2 receptor from diverse Indian human genome with the spike protein variants of SARS-CoV-2
Name of PI	: Dr. Surajit Basak, ICMR-NICED
Funding Agency	: ICMR
Period	: 2022-2024
Project Title	: Molecular characterization of HIV to detect drug resistance mutations in the population of Eastern part of India
Name of PI	: Dr. Agniva Majumdar
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	: Dr. Debjit Chakraborty
Funding Agency	: ICMR
Period	: 2022 - 2025
Project Title	: Computational screening and experimental validation of autophagy modulators against <i>H. pylori</i> infection: a novel approach towards drug development
Name of PI	: Sushmita Bhattacharya
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	: Dr. Surajit Basak, ICMR NICED
Funding Agency	: DHR Grant In Aid
Period	: 2021-2024
Project Title	: Exploring antimicrobial therapeutics against Multi drug Resistant enteric bacteria (MDR) causing sepsis from traditional plants of North- East India: Addressing the problem of antimicrobial resistance
Name of PI	: Sushmita Bhattacharya and Indira Devi
Names of CoI /CoPI/ collaborators with name of collaborating institute(s)	: Dr. Sulagna Basu, ICMR NICED Institute of Bioresources and Sustainable Development (IBSD), Department of Biotechnology, Govt. of India, Takyelpat, Imphal - 795001, Manipur, India
Funding Agency	: DBT
Period	: 2022-2024

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 : 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
 Funding Agency : ICMR
 Period : 2022-till date

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

PUBLICATIONS

1. Alcantara LCJ, Amenga-Etego L, Andersson R, Bhaumik M, Choi YK, Decaluwe H, Geoghegan J, Haagmans BL, López S, Mukhtar MM, Nelwan E, Rahal EA, Sato K, Sklan EH, Fang YSC. Methods for fighting emerging pathogens. *Nat Methods*. 2022 Apr;19(4):395-397. doi: 10.1038/s41592-022-01441-2. PMID: 35396474
2. Badr HS, Colston JM, Nguyen NH, Chen YT, Burnett E, Ali SA, Rayamajhi A, Satter SM, Van Trang N, Eibach D, Krumkamp R, May J, Adegnika AA, Manouana GP, Kremsner PG, Chilengi R, Hatyoka L, Debes AK, Ateudjieu J, Faruque ASG, Hossain MJ, Kanungo S, Kotloff KL, Mandomando I, Nisar MI, Omoro R, Sow SO, Zaidi AKM, Lambrecht N, Adu B, Page N, Platts-Mills JA, Mavacala Freitas C, Pelkonen T, Ashorn P, Maleta K, Ahmed T, Bessong P, Bhutta ZA, Mason C, Mduma E, Olortegui MP, Peñataro Yori P, Lima AAM, Kang G, Humphrey J, Ntozini R, Prendergast AJ, Okada K, Wongboot W, Langeland N, Moyo SJ, Gaensbauer J, Melgar M, Freeman M, Chard AN, Thongpaseuth V, Hout E, Zaitchik BF, Kosek MN. Spatiotemporal variation in risk of Shigella infection in childhood: a global risk mapping and prediction model using individual participant data. *Lancet Glob Health*. 2023 Mar;11(3):e373-e384. doi: 10.1016/S2214-109X(22)00549-6. PMID: 36796984; PMCID: PMC10020138
3. Banerjee A, Mazumder A, Roy J, Das J, Majumdar A, Chatterjee A, Biswas NK, Chawla Sarkar M, Das S, Dutta S, Maitra A. Emergence of a unique SARS-CoV-2 Delta sub-cluster harboring a constellation of co-appearing non-Spike mutations. *J Med Virol*. 2023 Jan;95(1):e28413. doi: 10.1002/jmv.28413. PMID: 36541745; PMCID: PMC9878222.
4. Banerjee S, Bhatta M, Nandi S, Dutta S, Saha MK. Diagnostic Accuracy of Human Immunodeficiency Virus In Vitro Assays Evaluated by the World Health Organization Prequalification Evaluation Laboratories: Systematic Review and Meta-Analysis. *Jpn J Infect Dis*. 2022 Sep 22;75(5):445-453. doi:10.7883/yoken.JJID.2021.720.
5. Banerjee S, Sarkar R, Mukherjee A, Miyoshi SI, Kitahara K, Halder P, Koley H, Chawla-Sarkar M. Quercetin, a flavonoid, combats rotavirus infection by deactivating rotavirus-induced pro-survival NF- κ B pathway. *Front Microbiol*. 2022 Aug 2;13:951716.
6. Barman RK, Chakrabarti AK, Dutta S. Prediction of Phage Virion Proteins Using Machine Learning Methods. *Molecules*. 2023 Feb 28;28(5):2238. doi: 10.3390/molecules28052238. PMID: 36903484; PMCID: PMC10004995.
7. Baruah N, Ahamad N, Halder P, Koley H, Katti DS. Facile synthesis of multi-faceted, biomimetic and cross-protective nanoparticle-based vaccines for drug-resistant Shigella: a flexible platform technology. *J Nano biotechnology*. 2023 Jan 29;21(1):34.
8. Baruah N, Halder P, Koley H, Katti DS. Stable Recombinant Invasion Plasmid Antigen C (IpaC)-Based Single Dose Nanovaccine for Shigellosis. *Mol Pharm*. 2022 Nov 7;19(11):3884-3893.
9. Basak P, Maitra P, Khan U, Saha K, Bhattacharya SS, Dutta M, Bhattacharya S. Capsaicin Inhibits *Shigella flexneri* Intracellular Growth by Inducing Autophagy. *Front Pharmacol*. 2022 Jul 6;13:903438
10. Bhatta M, Majumdar A, Ghosh U, Ghosh P, Banerji P, Aridoss S, Royal A, Biswas S, Venkatesh BT, Adhikary R, Dutta S. Sexually transmitted infections among key populations in India: A protocol for systematic review. *PLoS One*. 2023 Mar 13;18(3):e0279048. doi: 10.1371/journal.pone.0279048. PMID: 36913427; PMCID: PMC10010531.
11. Bhatta M, Nandi S, Dutta S, Saha MK. Coronavirus (SARS-CoV-2): a systematic review for potential vaccines. *Hum Vaccin Immunother*. 2022 Dec; 18(1):1865774.
12. Caigoy JC, Shimamoto T, Mukhopadhyay AK, Shinoda S, Shimamoto T. Sequence Polymorphisms in *Vibrio cholerae* HapR Affect Biofilm Formation under Aerobic and Anaerobic Conditions. *Appl Environ Microbiol*. 2022 Sep 13;88(17):e0104422.
13. Calcuttawala F, Shaw R, Sarbajna A, Dutta M, Sinha S, K Das Gupta S. Apoptosis like symptoms associated with abortive infection of Mycobacterium smegmatis by mycobacteriophage D29. *PLoS One*. 2022 May 17;17(5):e0259480
14. Carvalho MJ, Sands K, Thomson K, Portal E, Mathias J, Milton R, Gillespie D, Dyer C, Akpulu C,

- Boostrom I, Hogan P, Saif H, Ferreira A, Nieto M, Hender T, Hood K, Andrews R, Watkins WJ, Hassan B, Chan G, Bekele D, Solomon S, Metaferia G, Basu S, Naha S, Sinha A, Chakravorty P, Mukherjee S, Iregbu K, Modibbo F, Uwaezuoke S, Audu L, Edwin CP, Yusuf AH, Adeleye A, Mukkadas AS, Zahra R, Shirazi H, Muhammad A, Ullah SN, Jan MH, Akif S, Mazarati JB, Rucogoza A, Gaju L, Mehtar S, Bulabula ANH, Whitelaw A, Roberts L; BARNARDS Group; Walsh TR. Antibiotic resistance genes in the gut microbiota of mothers and linked neonates with or without sepsis from low- and middle-income countries. *Nat Microbiol.* 2022 Sep;7(9):1337-1347. doi: 10.1038/s41564-022-01184-y. Epub 2022 Aug 4.
15. Chadha M, Prabhakaran AO, Choudhary ML, Biswas D, Koul P, Kaveri K, Dar L, Mamta CS, Jadhav S, Bhardwaj SD, Laserson K, Saha S, Potdar V. Multisite surveillance for influenza and other respiratory viruses in India: 2016-2018. *PLOS Glob Public Health.* 2022 Nov 4;2(11):e0001001. doi: 10.1371/journal.pgph.0001001. PMID: 36962617; PMCID: PMC10022084.
 16. Chakraborty D, Debnath F, Kanungo S, Mukhopadhyay S, Chakraborty N, Basu R, Das P, Datta K, Ganguly S, Banerjee P, Kshirsagar N, Dutta S. Rationality of Prescriptions by Rational Use of Medicine Consensus Approach in Common Respiratory and Gastrointestinal Infections: An Outpatient Department Based Cross-Sectional Study from India. *Trop Med Infect Dis.* 2023Jan;8(2):88; <https://doi.org/10.3390/tropicalmed8020088>
 17. Chakraborty M, Gautam A, Das O, Masid A, Bhaumik M. Prenatal arsenic exposure stymies gut butyrate production and enhances gut permeability in post natal life even in absence of arsenic deftly through miR122-Occludin pathway. *Toxicol Lett.* 2023 Feb 1;374:19-30. doi: 10.1016/j.toxlet.2022.11.011. Epub 2022 Dec 5. PMID: 36473683.
 18. Chandra P, Banerjee S, Saha P, Chawla-Sarkar M, Patra U. Sneaking into the viral safe-houses: Implications of host components in regulating integrity and dynamics of rotaviral replication factories. *Front Cell Infect Microbiol.* 2022 Sep 14;12:977799.
 19. Chatterjee A, Basu B, Roy D, Chakraborty N. Critical diagnosis of HCMV induced enterocolitis in a preterm neonate admitted at a tertiary care hospital of Eastern India. *Japanese J Gastroenterol Res.* 2022 Jul; 2(10): 1098.
 20. Chatterjee A, Roy D, Mukherjee S, Ghosh H, Maiti A, Basu R, Chakraborty N. A comparative analysis depicting the disease characteristics and phylogenetic signature of human cytomegalovirus infection in Human Immunodeficiency Virus 1 seropositive patients with end-organ retinitis and gastro-enteric diseases. *Sci Rep.* 2022 May 10;12(1):7617. doi: 10.1038/s41598-022-11727-2. PMID: 35538132; PMCID: PMC9091246.
 21. Chowdhury G, Ramamurthy T, Das B, Ghosh D, Okamoto K, Miyoshi SI, Dutta S, Mukhopadhyay AK. Characterization of NDM-5 Carbapenemase-Encoding Gene (blaNDM-5) - Positive Multidrug Resistant Commensal *Escherichia coli* from Diarrheal Patients. *Infect Drug Resist.* 2022 Jul 8;15:3631-3642. doi: 10.2147/IDR.S364526. PMID: 35837541; PMCID: PMC9275505.
 22. Chowdhury G, Das B, Kumar S, Pant A, Mukherjee P, Ghosh D, Koley H, Miyoshi SI, Okamoto K, Paul A, Dutta S, Ramamurthy T, Mukhopadhyay AK. Genomic insights into extensively drug-resistant *Pseudomonas aeruginosa* isolated from a diarrhea case in Kolkata, India. *Future Microbiol.* 2023 Feb;18:173-186. doi: 10.2217/fmb-2022-0140. Epub 2023 Mar 14. PMID: 36916516.
 23. Das O, Kundu J, Ghosh A, Gautam A, Ghosh S, Chakraborty M, Masid A, Gauri SS, Mitra D, Dutta M, Mukherjee B, Sinha S, Bhaumik M. AUF-1 knockdown in mice undermines gut microbial butyrate-driven hypocholesterolemia through AUF-1-Dicer-1-mir-122 hierarchy. *Front Cell Infect Microbiol.* 2022 Dec19;12:1011386. doi: 10.3389/fcimb.2022.1011386.
 24. Debnath F, Chakraborty D, Giri S, Saha S, Pyne S, Chakraverty R, Majumdar A, Deb AK, Diwan V, Bhatia R, Dutta S. Existing Policies/Guidelines on the Environmental Dimension of Antimicrobial Resistance in India: An Insight into the Key Facets through Review and SWOT Analysis. *Trop Med Infect Dis.* 2022 Oct 29;7(11):336. doi: 10.3390/tropicalmed7110336. PMID: 36355880; PMCID: PMC9699572.
 25. Dey TK, Bose P, Paul S, Karmakar BC, Saha RN, Gope A, Koley H, Ghosh A, Dutta S, Dhar P, Mukhopadhyay AK. Protective efficacy of fish oil nanoemulsion against non-typhoidal *Salmonella* mediated mucosal inflammation and loss of barrier function. *Food Funct.* 2022 Oct

- 3;13(19):10083-10095.
26. Ganguli D, Chakraborty S, Chakraborty S, Pal A, Gope A, Das S. Macrophage Cell Lines and Murine Infection by *Salmonella enterica* Serovar Typhi L-Form Bacteria. *Infect Immun*. 2022 Jun 16;90(6):e0011922. doi: 10.1128/iai.00119-22.
 27. Ganguly S, Barkataki S, Sanga P, Boopathi K, Kanagasabai K, Devika S, Karmakar S, Chowdhury P, Sarkar R, Raj D, James L, Dutta S, Campbell SJ, Murhekar M. Epidemiology of Soil-Transmitted Helminth Infections among Primary School Children in the States of Chhattisgarh, Telangana, and Tripura, India, 2015-2016. *Am J Trop Med Hyg*. 2022 July 13;107(1):122-9. doi:10.4269/ajtmh.21-1185.
 28. Ganguly S, Chakraborty D, Banerjee S, Debnath F, Biswas S, Majumdar A, Dutta S. Vertical Transmission Rate of Human Immunodeficiency Virus Exposed Twin Pregnancies and Associated Factors in West Bengal, India: a Retrospective Cohort Study. *Jpn J Infect Dis*. 2023 Mar 24;76(2):145-150.
 29. Ganguly S, Chakraborty D, Debnath F, Biswas S, Majumdar A, Saha MK, Dutta S. Epidemiological drivers of mother to child HIV transmission in West Bengal, India: A retrospective cohort study. *Int J STD AIDS*. 2022 Apr;33(5):472-478.
 30. Ghosh D, Chowdhury G, Samanta P, Shaw S, Deb AK, Bardhan M, Manna A, Miyoshi SI, Ramamurthy T, Dutta S, Mukhopadhyay AK. Characterization of diarrhoeagenic *Escherichia coli* with special reference to antimicrobial resistance isolated from hospitalized diarrhoeal patients in Kolkata (2012-2019), India. *J Appl Microbiol*. 2022 Jun;132(6):4544-4554.
 31. Ghosh M, Basak S, Dutta S. Natural selection shaped the evolution of amino acid usage in mammalian toll like receptor genes. *Comput Biol Chem*. 2022 Apr;97, 107637.
 32. Hart NH, Crawford-Williams F, Crichton M, Yee J, Smith TJ, Koczwara B, Fitch MI, Crawford GB, Mukhopadhyay S, Mahony J, Cheah C, Townsend J, Cook O, Agar MR, Chan RJ. Unmet supportive care needs of people with advanced cancer and their caregivers: A systematic scoping review. *Crit Rev Oncol Hematol*. 2022 Aug;176:103728.
 33. Howlader DR, Bhaumik U, Halder P, Satpathy A, Sarkar S, Ghoshal M, Maiti S, Withey JH, Mitobe J, Dutta S, Koley H. An Experimental Adult Zebrafish Model for *Shigella* Pathogenesis, Transmission, and Vaccine Efficacy Studies. *Microbiol Spectr*. 2022 Jun 29;10(3):e0034722.
 34. Jana PK, Patoda S, Roy PK, Ghosh B, Kar S, Debnath A, Mukherjee S, Chatterjee A, Majumdar A, Dutta S. Information on Recent Monkey pox Outbreak: Systematic Search and Content Analysis of YouTube Videos. *Mayo Clin Proc: Digit Heal*. 2023 Mar;1(1):40-51.
 35. Karmakar BC, Paul S, Basak S, Ghosh M, Mukherjee P, Das R, Chaudhuri S, Dutta S, Mukhopadhyay AK. Development and evaluation of a simple PCR assay and nested PCR for rapid detection of clarithromycin-resistant *Helicobacter pylori* from culture and directly from the biopsy samples in India. *Gut Pathog*. 2023 Feb 14;15(1):7.
 36. Kanungo S, Azman AS, Ramamurthy T, Deen J, Dutta S. Cholera. *Lancet*. 2022 Apr 9;399(10333):1429-1440. doi: 10.1016/S0140-6736(22)00330-0. PMID: 35397865.
 37. Kanungo S, Chatterjee P, Bavdekar A, Murhekar M, Babji S, Garg R, Samanta S, Nandy RK, Kawade A, Boopathi K, Kanagasabai K, Kamal VK, Kumar VS, Gupta N, Dutta S. 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. *Lancet Infect Dis*. 2022 Aug;22(8):1191-1199. doi:10.1016/S1473-3099(22)00161-X.
 38. Kumar P, Das C, Kumar A, Sahu D, Rai SK, Godbole S, Arumugam E, P V M L, Dutta S, Devi HS, Vardhana Rao Mendu V, Kant S, Pandey A, Reddy DCS, Mehendale S, Rajan S. Diversity in HIV epidemic transitions in India: An application of HIV epidemiological metrics and benchmarks. *PLoS One*. 2022 Jul 18;17(7):e0270886. doi: 10.1371/journal.pone.0270886.
 39. Kumar S, Mehrotra T, Talukdar D, Verma J, Chandra Karmakar B, Paul S, Chaudhuri S, Kumari Pragasam A, Bakshi S, Kumari S, Chawla M, Purohit A, Porey Karmakar S, Mutreja A, Banerjee S, Ray A, Ramamurthy T, Mukhopadhyay AK, Das B. Region-specific genomic signatures of multidrug-resistant *Helicobacter pylori* isolated from East and South India. *Gene*. 2022 Dec 30;847:146857.
 40. Maitra P, Basak P, Okamoto K, Miyoshi SI, Dutta S, Bhattacharya S. Asiatic acid inhibits intracellular

- Shigella flexneri* growth by inducing antimicrobial peptide gene expression. J Appl Microbiol. 2023 Feb 16;134(2):lxac076.
41. Mitra S, Lo M, Saha R, Deb AK, Debnath F, Miyoshi SI, Dutta S, Chawla-Sarkar M. Epidemiology of major entero-pathogenic viruses and genetic characterization of Group A rotaviruses among children (≤ 5 years) with acute gastroenteritis in eastern India. J Appl Microbiol. 2022 Aug;133(2):758-783.
 42. Majumdar A, Gupta R, Chatterjee A, Banu H, Biswas M, Gupta R, Mukherjee S, Sadhukhan P, Dutta S. A retrospective analysis of serological & molecular testing data on dengue fever in Kolkata & adjacent districts during 2016-2019. Indian J Med Res. 2022 Oct-Nov;156(4&5):608-614.
 43. Milton R, Gillespie D, Dyer C, Taiyari K, Carvalho MJ, Thomson K, Sands K, Portal EAR, Hood K, Ferreira A, Hender T, Kirby N, Mathias J, Nieto M, Watkins WJ, Bekele D, Abayneh M, Solomon S, Basu S, Nandy RK, Saha B, Iregbu K, Modibbo FZ, Uwaezuoke S, Zahra R, Shirazi H, Najeeb SU, Mazarati JB, Rucogoza A, Gaju L, Mehtar S, Bulabula ANH, Whitelaw AC, Walsh TR; BARNARDS Group; Chan GJ. Neonatal sepsis and mortality in low-income and middle-income countries from a facility-based birth cohort: an international multisite prospective observational study. Lancet Glob Health. 2022 May;10(5):e661-e672. doi: 10.1016/S2214-109X(22)00043-2. PMID: 35427523; PMCID: PMC9023753.
 44. Mondal P, Mallick B, Dutta M, Dutta S. Isolation, characterization, and application of a novel polyvalent lytic phage STWB21 against typhoidal and nontyphoidal Salmonella spp. Front Microbiol. 2022 Aug 22;13:980025.
 45. Mukhopadhyay S. Academics and Research Beyond the 'disciplines': Transforming the Healthcare for a Better India with Interdisciplinary Approaches (Editorial). J West Bengal Univ Health Sci. 2022 Oct; 3(2):1-4.
 46. Mukhopadhyay S, Singhal S. Promotional drug literatures in India and Adherence to WHO Ethical Guidelines: Are we Following the Standard? J West Bengal Univ Health Sci. 2022 Jul; 3(1):37-43.
 47. Mukhopadhyay U, Patra U, Chandra P, Saha P, Gope A, Dutta M, Chawla-Sarkar M. Rotavirus activates MLKL-mediated host cellular necroptosis concomitantly with apoptosis to facilitate dissemination of viral progeny. Mol Microbiol. 2022 Apr;117(4):818-836. doi: 10.1111/mmi.14874. Epub 2022 Jan 12. PMID: 34954851.
 48. Muzembo BA, Kitahara K, Mitra D, Ohno A, Khatiwada J, Dutta S, Miyoshi SI. Burden of Shigella in South Asia: a systematic review and meta-analysis. J Travel Med. 2023 Feb 18;30(1):taac132.
 49. Muzembo BA, Kitahara K, Mitra D, Ohno A, Khatiwada J, Dutta S, Miyoshi SI. Shigellosis in Southeast Asia: A systematic review and meta-analysis. Travel Med Infect Dis. 2023 Mar-Apr;52:102554. doi: 10.1016/j.tmaid.2023.102554. Epub 2023 Feb 16. PMID: 36792021.
 50. Naha A, Withey JH, Mukherjee P, Saha RN, Samanta P, Ghosh A, Miyoshi SI, Dutta S, Mukhopadhyay AK. Elucidating the correlation between the number of TTTTGAT heptamer repeats and cholera toxin promoter activity in Vibrio cholerae O1 pandemic strains. FEMS Microbiol Lett. 2022 May 11;369(1):fnac041. doi: 10.1093/femsle/fnac041. PMID: 35438174.
 51. Naha S, Sands K, Mukherjee S, Dutta S, Basu S. A 12 year experience of colistin resistance in Klebsiella pneumoniae causing neonatal sepsis: two-component systems, efflux pumps, lipopolysaccharide modification and comparative phylogenomics. J Antimicrob Chemother. 2022 May 29;77(6):1586-1591. doi: 10.1093/jac/dkac083. PMID: 35323923.
 52. Nayak S, Kumar P, Shankar R, Mukhopadhyay AK, Mandal D, Das P. Biomass derived self-assembled DNA-dot hydrogels for enhanced bacterial annihilation. Nanoscale. 2022 Nov 10;14(43):16097-16109. doi: 10.1039/d2nr03810b. PMID: 36226636.
 53. Patel K, Nayak B, Rana S, Krishnan P, Tandale BV, Basak S, Sinha A, Kumar MS, Borah P, Singh H, Gupta N, Dutta S, Mohan A, Das MK, Landge Y, Ganguly B, Devi U, Pati S, Palo SK. Enablers and barriers towards ensuring routine immunization services during the COVID-19 pandemic: findings from a qualitative study across five different states in India. Trans R Soc Trop Med Hyg. 2022 Sep 10;116(9):814-821. doi: 10.1093/trstmh/trac011. PMID: 35235677; PMCID: PMC8903434.
 54. Ramamurthy T, Ghosh A, Chowdhury G, Mukhopadhyay AK, Dutta S, Miyoshi SI. Deciphering the genetic network and programmed regulation of antimicrobial resistance in bacterial pathogens. Front Cell

- Infect Microbiol. 2022 Nov 23;12:952491. doi: 10.3389/fcimb.2022.952491. PMID: 36506027; PMCID: PMC9727169.
55. Ramamurthy T, Pragasam AK, Taylor-Brown A, Will RC, Vasudevan K, Das B, Srivastava SK, Chowdhury G, Mukhopadhyay AK, Dutta S, Veeraraghavan B, Thomson NR, Sharma NC, Nair GB, Takeda Y, Ghosh A, Dougan G, Mutreja A. *Vibrio cholerae* O139 genomes provide a clue to why it may have failed to usher in the eighth cholera pandemic. *Nat Commun*. 2022 Jul 5;13(1):3864. doi: 10.1038/s41467-022-31391-4. PMID: 35790755; PMCID: PMC9256687.
 56. Roy S, Junghare V, Dutta S, Hazra S, Basu S. Differential Binding of Carbapenems with the AdeABC Efflux Pump and Modulation of the Expression of AdeB Linked to Novel Mutations within Two-Component System AdeRS in Carbapenem-Resistant *Acinetobacter baumannii*. *mSystems*. 2022 Aug 30;7(4):e0021722. doi: 10.1128/msystems.00217-22. Epub 2022 Jun 23. PMID: 35735748; PMCID: PMC9426577.
 57. Saha K, Sarkar D, Khan U, Karmakar BC, Paul S, Mukhopadhyay AK, Dutta S, Bhattacharya S. Capsaicin Inhibits Inflammation and Gastric Damage during *H. pylori* Infection by Targeting NF- κ B-miRNA Axis. *Pathogens*. 2022 Jun 1;11(6):641. doi: 10.3390/pathogens11060641. PMID: 35745495; PMCID: PMC9227394.
 58. Sands K, Carvalho MJ, Spiller OB, Portal EAR, Thomson K, Watkins WJ, Mathias J, Dyer C, Akpulu C, Andrews R, Ferreira A, Hender T, Milton R, Nieto M, Zahra R, Shirazi H, Muhammad A, Akif S, Jan MH, Iregbu K, Modibbo F, Uwaezuoke S, Chan GJ, Bekele D, Solomon S, Basu S, Nandy RK, Naha S, Mazarati JB, Rucogoza A, Gaju L, Mehtar S, Bulabula ANH, Whitelaw A; BARNARDS Group; Walsh TR. Characterisation of Staphylococci species from neonatal blood cultures in low- and middle-income countries. *BMC Infect Dis*. 2022 Jul 1;22(1):593. doi: 10.1186/s12879-022-07541-w. PMID: 35790903; PMCID: PMC9254428.
 59. Sarkar A, Sanyal S, Majumdar A, Tewari DN, Bhattacharjee U, Pal J, Chakrabarti AK, Dutta S. Development of lab score system for predicting COVID-19 patient severity: A retrospective analysis. *PLoS One*. 2022 Sep 9;17(9):e0273006.
 60. Sarkar R, Banerjee S, Halder P, Koley H, Komoto S, Chawla-Sarkar M. Suppression of classical nuclear import pathway by importazole and ivermectin inhibits rotavirus replication. *J Antimicrob Chemother*. 2022 Nov 28; 77(12):3443-3455.
 61. Sardar SK, Das K, Maruf M, Halder T, Saito-Nakano Y, Kobayashi S, Dutta S, Ganguly S. Molecular evidence suggests the occurrence of *Entamoeba moshkovskii* in pigs with zoonotic potential from eastern India. *Folia Parasitol (Praha)*. 2022 May 23; 69:2022.012. doi: 10.14411/fp.2022.012.
 62. Sardar SK, Kobayashi S, Das K, Saito-Nakano Y, Dutta S, Nozaki T, Ganguly S. Development of a simple PCR-RFLP technique for detection and differentiation of *E. histolytica*, *E. dispar* and *E. moshkovskii*. *Parasitol Res*. 2023 Jan;122(1):139-144. doi: 10.1007/s00436-022-07706-1. Epub 2022 Oct 29. PMID: 36308533.
 63. Shaw S, Samanta P, Chowdhury G, Ghosh D, Dey TK, Deb AK, Ramamurthy T, Miyoshi SI, Ghosh A, Dutta S, Mukhopadhyay AK. Altered molecular attributes and antimicrobial resistance patterns of *Vibrio cholerae* O1 El Tor strains isolated from the cholera endemic regions of India. *J Appl Microbiol*. 2022 Dec;133(6):3605-3616. doi: 10.1111/jam.15794. Epub 2022 Sep 7.
 64. Singh K, Biswas A, Chakrabarti AK, Dutta S. Phage Therapy as a Protective Tool Against Pathogenic Bacteria: How Far We Are? *Curr Pharm Biotechnol*. 2023 Jan;24(10):1277-1290. doi: 10.2174/1389201024666221207114047. PMID: 36503459.
 65. Singh MR, Huidrom S, Dutta S, Sadhukhan PC, Singh KL. Comparative Evaluation of Three Diagnostic Tools for the Detection of Hepatitis C Virus among High-risk Individuals in a Tertiary Care Centre of Northeast India. *J Clin Diagn Res*. 2022 Jul; 16(7): DC13-DC17.
 66. Singh N, Tapader R, Chatterjee S, Pal A, Pal A. Subtilisin from *Bacillus amyloliquefaciens* induces apoptosis in breast cancer cells through ubiquitin-proteasome-mediated tubulin degradation. *Int J Biol Macromol*. 2022 Nov 1;220:852-865. doi: 10.1016/j.ijbiomac.2022.08.086. Epub 2022 Aug 17. PMID: 35985398.
 67. Takahashi E, Motooka D, Nakamura S, Miyoshi SI, Chowdhury G, Mukhopadhyay AK, Dutta S, Morita

- D, Iida T, Okamoto K. Metagenomic analysis of diarrheal stools in Kolkata, India, indicates the possibility of subclinical infection of *Vibrio cholerae* O1. *Sci Rep*. 2022 Nov 14;12(1):19473.
68. Talukdar R, Barman D, Thakkar V, Kanungo S. Utilization of dental care services among adult Indian population: A meta-analysis of evidence from 2011-2022. *Health Promot Perspect*. 2022 Dec 31;12(4):325-335. doi: 10.34172/hpp.2022.42. PMID: 36852206; PMCID: PMC9958237.
 69. Tewari DN, Biswas S, Chakrabarti AK, Dutta S. Viral Inactivation and Biocompatibility Study of Electrically Activated Water Mist. *Microbiol Insights*. 2022 May 13;15: 11786361221096651. doi: 10.1177/11786361221096651.
 70. Verma P, Banerjee S, Baskey U, Dutta S, Bakshi S, Das R, Samanta S, Dutta S, Sadhukhan PC. Clinicopathological alteration of symptoms with serotype among dengue infected pediatric patients. *J Med Virol*. 2022 Sep; 94(9):4348-4358. doi: 10.1002/jmv.27862. Epub 2022 May 26.
 71. Yadav PD, Kaur H, Gupta N, Sahay RR, Sapkal GN, Shete AM, Deshpande GR, Mohandas S, Majumdar T, Patil S, Pandit P, Kumar A, Nyayanit DA, Sreelatha KH, Manjusree S, Sami H, Khan HM, Malhotra A, Dhingra K, Gadepalli R, Sudha Rani V, Singh MK, Joshi Y, Dudhmal M, Duggal N, Chhabra M, Dar L, Gawande P, Yemul J, Kalele K, Arjun R, Nagamani K, Borkakoty B, Sahoo G, Praharaj I, Dutta S, Barde P, Jaryal SC, Rawat V. Zika Vector Borne Disease Detected in Newer States of India Amidst the COVID-19 Pandemic. *Front Microbiol*. 2022 Jun 10; 13:888195. doi:10.3389/fmicb.2022.888195.

Book Chapter

1. Ramamurthy, T, A.K. Mukhopadhyay, B. Das, R.K. Nandy, A. Mutreja, and G. Balakrish Nair. *Vibrio cholerae* In: *Molecular Typing in Bacterial Infections*, Volume II. I. de Filippis (ed.), Springer Nature, Switzerland AG. 2022, pp 83-110.
2. Majumdar A, Jana PK. Emerging viral diseases. In: *Viral Infections and Antiviral Therapies*. Elsevier; 2023. p. 25–37. doi: 10.1016/B978-0-323-91814-5.00024-6

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Employees transferred to ICMR-NICED during April'2022 to March'2023

Name	Designation	Date
Mr. T. Gupta	TO-A	01.08.2022
Mr. S Das	Sr. Technician 2	09.12.2022
Mr. S. Hazra	Laboratory Assistant	12.12.2022
Mr. A. Das	Laboratory Assistant	07.12.2022
Mr. K. Sen	Technical Assistant	09.12.2022

Employees retired from ICMR-NICED during April'2022 to March'2023

Name of the Employee	Designation	Date of Retirement
Mr. Haro Prosad Das	Sr. Technician (3)	31.01.2023
Dr. Kamallesh Sarkar	Scientist 'G'	28.02.2023

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

Name of the Employee	Designation	Date of Retirement / V.R.	Passed away on
Mr. Bhagirath Mondal	Ex-S.T.A.	31.07.1996	13.01.2023
Mr. Paramananda Sen	Ex-A.C.O.	30.11.2008	24.07.2022
Mr. Gajendra Nath Patra	Ex-T.A.	29.02.2012	26.11.2022
Mr. Alok Kr. Mallik	Ex-T.O.	31.07.2005	01.07.2022
Mr. Sankar Mallick	Ex-Lab. Asstt.	01.11.2019	10.07.2022

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