INDIAN COUNCIL OF MEDICAL RESEARCH
DEPARTMENT OF HEALTH RESEARCH
Major areas of research undertaken by ICMR Institutes

S.No.	Institute	Major Research Areas

1	National JALMA Institute for Leprosy & Other Mycobacterial Diseases (NJILOMD)	**Leprosy and TB**
		• Clinical trials
		• Epidemiological studies including molecular epidemiology
		• Basic fundamental research
		  • Microbiology and Molecular Biology
		  • Immunology
		  • Biochemistry
		  • Bioinformatics
		• Animal experimentation
		• Operational research
		• Implementation research

2	National Institute of Occupational Health (NIOH)	• Epidemiological and environmental monitoring and corollary toxicological studies in hazardous occupations for recognition and evaluation of risk factors • Development of tools for early diagnosis of health impairment and design of appropriate intervention measures for the prevention of hazards at work places. • Occupational and environmental epidemiology • Toxicology (metal, pesticide, reproductive, geno and neurobehavioral) • Environmental pollution (air, water, noise, thermal) • Development of safety norms (chemical physical agents) • Operational research • Women and children health • Agricultural health
3	National Centre for Disease Informatics and Research (NCDIR)	• Setting up Registries on Cancer, Cardiovascular Diseases, Diabetes, Stroke and Other relevant Non Communicable Diseases • Translational Research through epidemiological and clinical research • Software development, implementation and adaptation for strengthening data capture, transmission, analysis and reporting. • Surveillance of above diseases using Disease informatics approach • Knowledge translation for public health utility.
4	National Institute for Research in Environmental Health (NIREH)	• Health needs of gas exposed population with focus on respiratory diseases, eye related diseases, renal diseases, reproductive and women's health and mental health • Research on cancers, genetic disorders, health status of second and third generation children in the exposed population and community building • Development of tools for biomedical informatics application in predicting disaster outcomes, selection of antidotes and other interventional methods
5	National Institute for Research in Tuberculosis (NIRT)	• Clinical trials in pulmonary &extrapulmonary TB, also addressing co-morbidities for framing guidelines • Innovative & indigenous tools for TB diagnosis & drug susceptibility testing • Socio-behavioural aspects of TB & HIV

		• Epidemiology & Molecular epidemiology of TB • Pharmacokinetic studies for dose optimisation in TB & HIV
6	National Institute of Epidemiology (NIE)	• Disease Surveillance(Rotavirus, Bacterial Meningitis, Virus Research and diagnostic Laboratory Network and HIV Sentinel Surveillance) • Non-Communicable diseases • Tribal Health • Health System Research • Leprosy epidemiology
7	National Institute of Malaria Research (NIMR)	• Epidemiology of malaria and dengue • Biology and control of vectors of malaria and other vector borne diseases • Evaluation of new insecticides, drugs and diagnostic kits • Biology of malaria parasite • Training, Information Education & Communication and support to National Vector Borne Disease Control Programme
8	National Institute of Pathology (NIP)	• Tumor biology (breast cancer, genitourinary malignancies, lymphoma, cancers in north east region), infectious diseases (chlamydia, leishmania), stem cell biology and environmental toxicology. • Genetic susceptibility for various familial and non-familial tumors, predictive and prognostic biomarkers, molecular pathology, molecular functional pathways and drug targets. • Investigation of the gene-environmental link responsible for very high incidence of several malignancies, especially those associated with tobacco and pesticide (oral, esophageal, gastric, lung and breast cancers) in north eastern states in India. • Studies on chlamydia infection on genital tract and coronary artery disease, including study on role of chlamydial heat shock protein in pathogenesis of genital tract infection in women. • Understanding the process of in vitro differentiation of *Leishmaniadonovoni*. • Studies on role of environmental toxicants especially heavy metal in cases of miscarriage. • Studies on utility of a patented synthetic thermo-reversible hydrogel polymer as supportive matrix towards the development of 3-D composite skin for application in wound healing and other dermatological disorders. • New high priority areas have been identified, viz.: lifestyle diseases, metabolic syndromes, chronic diseases biology and telepathlogy.
9	National Institute of Medical Statistics (NIMS)	• HIV Sentinel Surveillance, Modelling, estimation and projection of HIV/AIDS in India and its States. • Clinical Trials Registry – India (CTRI). • Survey methodology and operations research including programme evaluation.
10	National Institute of Nutrition (NIN)	• Community studies to monitor diet and nutrition status of the country. • Effective intervention strategies and models for prevention and control of nutritional problems in the country. • Operational research with respect to planning, implementation and strengthening of national nutrition programmes. • Outbreak investigations of food borne diseases arising from contaminants and toxicants • Development of food based micronutrient fortification strategies to control hidden hunger in the country • Research in development and dissemination of effective outreach methods for nutrition communication.

		• Food safety, drug toxicity and safety, dietary management of chronic diseases, preclinical toxicology of drugs, biotech products developed indigenously.
11	National Animal Resource Facility for Biomedical Research (NARFBR)	• Care, Breeding, Management and Experimentation using laboratory animals in biomedical research
12	National Institute for Research in Tribal Health (NIRTH)	• Hemoglobinopathies • Malaria with specific focus on tribal populations • Tuberculosis specific focus on tribal populations of the region • Viral diseases of public health importance in central India • Health related Social and behaviouralpractises of Tribal population
13	National Institute of Cholera and Enteric Diseases (NICED)	• Behavioural intervention trials and trials of drugs and/or vaccines against cholera and other enteric infections • Identification of emerging diarrhoeal pathogens, investigating outbreaks, developing diagnostics and monitoring antimicrobial resistance in them with exploration of associated genotypic changes and linked mechanisms • Exploring various aspects of pathophysiology and host pathogen relationships in virus and bacterial diarrhoea including tracking of novel pathoges infecting humans, which have implications for intervention development and policy advocacy • Research on Arboviruses, such as Dengue, Japanese Encephalitis, Chikungunya, West Nile virus for rapid and reliable detection as well as molecular characterization
14	National Institute for Research in Reproductive Health (NIRRH)	• Fundamental, clinical and operational research on various aspects of reproductive health • Identification of cytogenetic abnormalities in developmental disorders • Diagnosis and management of metabolic disorders • Elucidation of genetic abnormalities in neuro-developmental and neuro-psychiatric disorder • Development of cellular model for various genetic neurodevelopmental disorders
15	National Institute of Immunohaemotology (NIIH)	• Hemoglobinopathies including beta thalassemia and sickle cell anemia and red cell enzymopathies and membranopathies • Human blood group systems and transfusion medicine • Inherited bleeding disorders including haemophilia and thrombotic disorders • Primary Immunodeficiency disorders • Inherited and acquired marrow failure syndromes including MDS, aplastic anemia and Fanconi's anemia • Hematolymphoid malignancies including ChrnoicMeyloid Leukemia and acute myeloid leukemia • Autoimmunde disorders • Transfusion transmitted disorders
16	National Institute of Cancer Prevention and Research (NICPR)	• Cytology • Epidemiology • Molecular biology • Bioinformatics • Molecular Diagnostics
17	Rajendra Memorial Research Institute of Medical Sciences (RMRIMS) , Patna	• Kala-azar (Visceral leishmaniasis) • Tuberculosis • Viral diseases (AES/JE, Dengue, Chikungunya etc) • Other vector borned disease like malaria, filarial • Diarrheal diseases

18	Vector Control Research Centre (VCRC)	• Vector biology, ecology and Integrated Vector management • Bio-diversity of vectors and parasites • Development of tools/agents for surveillance and control of vector/parasite/pathogen • Development of tools for decision support • Optimization of intervention strategies for prevention and control • Surveillance of vector borne diseases for development of early warning system • Development and evaluation of diagnostic tools of vector borne diseases • Understanding the molecular mechanisms of vector-pathogen interactions under different ecological, vector behavioural and changes in climatic conditions • Research on emerging and re-emerging vector borne diseases especially on tribal areas • Knowledge translational and product development for novel and effective vector borne diseases control strategies
19	National Institute of Virology (NIV)	• Outbreak investigation including COVID-19, Nipah, Zika etc. • Precise assessment of prevalence of different viruses in different populations at different time points, identifying risk groups requiring interventions. Conducting similar studies in animals / mosquitoes and other insects. • Development of diagnostics, both serological and molecular. • Understanding of the genetic variation in viruses with time, location and clinical presentation • Development of vaccines employing different approaches • Pathogenesis of viral infections in animal models and humans • Partner to several national and international studies assessing efficacy of antivirals / vaccines, prevalence of viral infections and characterization of viruses. • To suggest preventive and control strategies for viral infections discovering viral diseases, outbreak investigations, diagnostic kits preparation and developing therapeutic • AFP Surveillance • Environmental Surveillance • Molecular epidemiology of polio and other Enteroviruses • Immunological studies on Enterovirus infections • Serosurveillance and vaccination strategies
20	National AIDS Research Institute (NARI)	• Conduct clinical trial of antiretroviral drugs, microbicides and vaccines • Basic studies on HIV and its immunopathogenesis and identify correlates of immune protection • Epidemiology of HIV infection • HIV and co-infections and comorbidities such as TB, STIs, Hepatitis and HPV, HIV related cancers. • Social and behavioural studies to identify factors related to the risk of HIV acquisition and drug adherence
21	Regional Medical Research Centre Bhubaneswar	• Vector borne Diseases & Neglected tropical diseases • Infectious Diseases (Bacterial & Tuberculosis) • Viral Diseases • Non communicable diseases, Nutrition &Haemoglobinopathy • Social Epidemiology & Maternal and child health
22	Regional Medical Research Centre Dibrugarh	• Cancer studies in NE India • Cardiovascular diseases • Malaria and trematode infection • Tuberculosis and other bacterial diseases

		• Viral diseases and other vector borne diseases
23	Regional Medical Research Centre, Port Blair	• Vector-borne diseases –diurnally sub-periodic filariasis, malaria dengue, chikungunya, ZIKA virus • Leptospirosis • Tuberculosis • Tribal health and traditional medicine or ethno medicine • Translational research: Development of DNA vaccine and DNA antibodies and diagnostic and herbal formulations
24	National Institute for Implementation Research on Non-Communicable Diseases, Jodhpur	• Silicosis and measures of its prevention useful for workers of sandstone quarries of Rajasthan. • Identifying and Implementing various Strategies for Screening, Management and Prevention of Sickle Cell Disease in Rajasthan • Strengthening State Health System for early detection of Breast Cancer involving strategic education and awareness among the women. • Management and control of vector borne diseases. • Improving Health and nutritional status of vulnerable segment of population by implementing multi-component health & nutrition education intervention.
25	National Institute of Traditional Medicine, Belgavi	• Traditional Medicine • Ethnopharmacology • Integrative Medicine • Regional Diseases: Water-borne infections and AMR • Regional Diseases: Vector-borne diseases
26	Regional Medical Research Centre Gorakhpur	• Japanese Encephalitis/AES • Scrub Typhus • Regional Health Issues

Major Achievements of ICMR and its institutes for last three years

Achievements in COVID-19: Various activities undertaken

I. Testing for COVID-19:

a. In January 2020, ICMR-NIV, Pune standardized the RT-PCR based diagnostic test and was the standalone lab for COVID testing, whereas today we have close to 2400 labs with testing capacity close to 14 lakh per day. 530/536 Medical Colleges are now testing for COVID-19 and 659/741 districts have a RTPCR testing facility whereas all 741 districts have RAT testing available. Proactive efforts are being made to establish facility in remaining districts through PM cares funds and other resources.

b. Resources in labs have been augmented by providing multiple RT-PCR machines, high throughput machines, automated RNA extraction platforms, increased manpower etc. This has led to a reduced turnaround time of testing wherein > 85% of the results are provided within 48 hours.

c. Immense efforts have been made to establish labs in difficult terrains like Ladakh, Sikkim, Arunachal Pradesh, Nagaland as well as other NER states, islands like Lakshwadeep and Andaman & Nicobar.

d. For remote and rural areas, TrueNat/CBNAAT platform, validated by WHO for TB, have been repurposed for COVID testing. Currently, close to 3000 TrueNat (indigenous platform)machines have been deployed.

e. High throughput machines (testing capacity of >1000 per day) were set up at 10 different locations in India and were inaugurated by Honb'le PM. Mobile testing labs were inaugurated by Hon'ble HM and deployed in collaboration with Spicehealth.

f. Rapid antigen testing was approved in last week of June. This point of care test has tremendously improved access and ease of testing. India became the first country to deploy COVID-19 RAT in program.

g. Strategy for pooled testing of samples was standardized and disseminated.

h. 24 validation centers have been set up for fast track validation of newer diagnostic commodities. So far, more than 1150 different diagnostics have been validated of which 577 are approved. In line with the "Atmanirbhar Bharat" initiative of the Hon'ble PM, ICMR has approved 416 (72%) indigenous test kits. Indigenous manufacturers are also being hand-held to improvise their products. Tenfold cost reduction has occurred.

i. Un-interrupted supply of testing commodities to states through 20 ICMR depots has been ensured.

j. ICMR- NIV team travelled to Iran to help in the evacuation of Indian shia pilgrims (>6000) stranded in Iran in Feb. 2020. RTPCR lab was set-up in Tehran and 2028 samples were collected from 5 cities (Qom, Tehran, Shiraz, Mashhad, Isfahan).Special flights operated by Indian Air Force & Iranian Airlines for repatriation of Indian Nationals.

k. A quarterly Quality Control program has been implemented for more than 1250 RTPCR laboratories. With the help of WHO External Quality Assurance program has been also been implemented. This effort is envisaged to improve the quality of testing.

l. A uniform data entry portal is hosted by ICMR. This database carries India's COVID-19 testing data for more than 20 crores tests.

m. A common sample referral form (SRF) has been developed and deployed with the help of National Information Centre (NIC) through the RTPCR application.

II. Nationwide serosurvey to determine the seroprevalence of SARS-CoV-2:

Blood samples from a total of 24000 samples from 71 districts were collected and tested for IgG antibodies against SARS-CoV-2. Three Nationwide serosurveys have been conducted from May 11 to June 4, 2020; August 17 to September 2 and December 17 to January 8. The nationwideadjusted sero-prevalence was found to be 0.73%; 7.1% and 21.5% respectively.The third serosurvey also included 7000 healthcare workers.

III. Isolation of SARS-CoV-2 virus by ICMR-NIV, Pune:

a. Three different strains of SARS-CoV-2 have been isolated and cultured:
   - India became the 5th country to isolate the virus in March 2020.
   - UK variant strain was isolated in December 2020
   - Brazil variant strain was isolated in February 2021

b. Virus isolation paved the way for development of following technologies:
   - Indigenous ELISA IgG kit by NIV, Pune. Technology was transferred to 7 Indian companies.
   - Hyper-immune horse serum, which offers a promising tool for prophylaxis and treatment of SARS-CoV-2 exposed/ infected individuals. ICMR has provided the virus and is working closely with three companies for clinical development of this product.
   - Development of indigenous whole virion inactivated vaccine by Bharat Biotech International Ltd.
   - Laboratory assays like the gold standard Plaque Reduction Neutralization Test (PRNT) was established.
   - Animal challenge experiments were conducted to understand the efficacy of vaccines and therapeutics.

IV. Drug Trials:

a. **World's largest Plasma Therapy Trial (PLACID):**The trial was conducted in a total of 464 participants across 39 hospitals. A set of clinical and laboratory parameters were monitored over 28-day period in patients enrolled in intervention (235) and control arms (229). The trial has revealed no significant benefit of plasma therapy in terms of reducing severity of disease and mortality.

b. **WHO Solidarity Trial:** India: ICMR-National AIDS Research Institute led the trial which was initiated trial in April 2020 across 26 hospitals and 1048 adults randomized. The globa trial in >11000 individuals concluded that Remdesivir, Hydroxychloroquine, Lopinavir and Interferon - little or no effect on overall mortality, initiation of ventilation and duration of hospital stay in hospitalized.

V. COVID-19 Vaccine trials supported by ICMR/DHR:

a. COVAXIN of Bharat Biotech International Ltd (BBIL):

- Provided virus strain
- Characterized vaccine strain
- Conducted preclinical studies in hamsters & monkeys
- Technical & Lab support for phase 1 & 2 trials.
- Technical & lab and financial support for phase 3 trials

b. COVID-19 vaccines manufactured by Serum Institute of India:

- Phase 2/3 studies of COVISHIELD (AstraZeneca)
- Phase 2/3 studies of COVOVAX (Novavax)
- Preclinical Hamster studies: indigenous candidates

c. ZyCoV-D of Zydus Healthcare:

- Preclinical studies in monkeys at ICMR-NIV, Pune

d. Proposals in pipeline:

- Preclinical studies in Monkeys of Biological Evans vaccine candidate
- Preclinical studies in rats and hamsters of vaccine candidates of Reliance Industries

VI. Other activities:

a) ICMR-NIV was the first in India to detect the presence of UK, Brazil and South African variants of SARS-CoV-2 in India.

b) As part of INSACOG and independently ICMR-NIV has sequenced more than 5000 sequences of SARS-CoV-2.

c) Vaccine portal of India was inaugurated recently by Hon'ble HFM in September 2020.

d) Laboratory studies for development of monoclonal antibodies for COVID-19 prophylaxis and treatment have been successfully completed. Clinical evaluation and next steps are being taken up.

e) COVID-19 clinical registry across 40 tertiary medical institutes of eminence have been established. Aim is to understand the demographic features, clinical outcome and design suitable treatment modalities for COVID-19 affected patients.

f) Ten COVID-19 biorepositories for helping industry/academia with appropriate samples of SARS-CoV-2 for developing indigenous diagnostics etc. have been established.

g) Sewage surveillance has been standardized to detect presence of SARS-CoV-2 as early warning signal to predict increase in disease prevalence in a particular zone.

h) ICMR has been issuing timely advisories, treatment modalities, discharge guidelines, testing advisories etc. through the National Task Force chaired by Member Niti Aayog.

i) More than 100 antiviral drugs/compounds have been screened for their antiviral potential.

j) Good quality research projects with high translational potential in areas of epidemiology & surveillance, laboratory diagnostics, clinical and operational research have been funded.

Other Achievements of ICMR in past 3 years
• **Successful Outbreak/ Epidemic Investigation & Mitigation:** COVID-19, Nipah, Zika; CDV in Gir Lions
• **Mission Mode Projects & Successful Demonstration projects in eliminable disease:** Establishment of MERA (Malaria Elimination Research Alliance) India & India Tuberculosis Research Consortium.Successful demonstration of CCMP &Mandla in Malaria Elimination; Triple Drug Therapy for Filariasis; Vaishali Model for Kala Azar; MIP in Leprosy.
• **National Prevalence &Sero-surveillance Surveys:** COVID-19, Tuberculosis, Dengue, Chikungunya, Diptheria, Rotavirus, Antimicrobial Resistance, Diabetes, Hypertension, Stroke, Cancer.
• **Affordable Technologies: Diagnostics:** TrueNAT for Covid-19, Nipah, Tuberculosis & Leptospirosis; COVID Kawach ELISA, Crimean-Congo haemorrhagic fever (CCHF) Sheep and Goat, Crimean Congo haemorrhagic fever (CCHF) in Cattle, Japanese Encephalitis virus (JEV) from Mosquito, Magnivisualizer. **Vaccines:** Covaxin for COVID-19; Shigella Vaccine; JENVAC for JE
• **Digital Interventions in Tackling NCDs:** Mission DELHI for heart attack, Mobile Stroke Unit in NE for stroke
• **Policy Interventions:** White paper on ENDS; Recommended Dietary Allowances; Bioethics & Stem Cell Guidelines.
• **Research Support to Ayushman Bharat:** Standard Treatment Workflows; Health Technology Assessment; National list of Essential Diagnostics, medicines & assistive technologies.
• **Infrastructure Development:** NIIH-Centre for Research, Management and Control of Haemolglobinopathies, Chandrapur; Centre for One Health, Nagpur; Regional Medical Research Centre, Gorakhpur; Samrat Ashok Tropical Disease Research Centre at RMRI, Patna; a field station at Keylong in Lahaul&Spiti district of Himachal Pradesh; NIN- Tata Centre of Excellence in Public Health Nutrition, Eco-friendly building of National Institute for Research in Environmental Health, Bhopal

Institute-wise Achievements:

ICMR-National Institute of Virology

- *SARS-COV-2 / COVID-19*
  - Optimized real-time RT-PCR assay for screening and confirmation
  - Supplied reagents and performed quality control
  - Confirmed initial imported cases, isolated and confirmed viruses
  - Full genome sequences of virus isolates and drug repurposing studies
  - Training and capacity building for first responders

- Provided assistance for evacuation of Indian nationals from Iran
- Antiviral testing studies related testing extended to CSIR-CCMB and IGIB
- Validation of COVID-19 real-time RT-PCR and rapid diagnostic kits

- *Nipah virus*
  - Identification of Nipah virus infection outbreaks in Kerala in 2018 and 2019
  - On field training and support of healthcare staff on infection prevention
  - Countrywide survey of Nipah virus in Pteropus bats from South Indian States
  - Indigenous serodiagnostic tests developed for IgM and IgG for surveillance studies

- *Zika virus*
  - Microcephaly in babies of Zika infected pregnant women in Rajasthan

- *Crimean Congo Haemorrhagic fever (CCHF)*
  - Investigation and follow up of cases in Gujarat and Rajasthan

- *Kyasanur Forest disease (KFD)*
  - Point of care real-time RT-PCR assay standardised in collaboration with MolBio
  - Phylogeography of KFD virus in India (1957–2017) revealed evolution and spread in theWestern Ghats region from Karnataka

- *Zoonoses*
  - Bat coronavirus detections in Pteropus and Rousettus species

- *Avian influenza*
  - Diagnosis, gene pool analysis and antiviral testing against H5N1 and H9N2 viruses

- *Influenza and respiratory virus infections*
  - Etiological profiling of influenza and respiratory viruses among SARI patients
  - Respiratory syncytial virus infections among tribal children in Melghat area
  - Evidence based advocacy for influenza prevention and control in elderly

- *Measles & Rubella*
  - Genotypic & antigenic studies for agreement between wild type and vaccine strains

- *Hepatitis viruses*
  - Hepatitis E infections severity related host & virus factors in pregnant women

- *Dengue & Chikungunya*
  - Monitoring of serotypes, genotypes and lineages in collaboration with VRDLs
  - Chikungunya severity biomarkers including cytokines and genotypes association
  - High endemicity of Dengue and Chikungunya reported in Western India
  - Chikungunya Phylogeography studies revealed persistent global transmissions of theIndian Ocean Lineage from India in association with mutational fitness
- *Encephalitic viruses*
  - JE virus Genotype III strains getting replaced with Genotype I strains recently
  - JE identified as major cause of encephalitis in central India despite JE vaccination

- *Arbovirus Diagnostics*

- Diagnostic kits for Dengue, Chikungunya and JE IgM testing under NVBDCP

- *Enteric viruses*
  - Surveillance of rota virus strains post vaccine introduction being monitored
  - Diagnostic testing for Hand foot and mouth disease (HFMD) among children

- *Polio virus*
  - Diagnostic support and strain surveillance for AFP and sewage-based surveillance
  - Development of Polio Essential Facility (PEF) for containment of polio viruses

- Diagnostic virology network for capacity strengthening for emerging infections

ICMR-National JALMA Institute for Leprosy & Other Mycobacterial Diseases, Agra

- Multicentric validation of an indigenous molecular tests for diagnosis of pulmonary tuberculosis and for diagnosis of drug resistant tuberculosis from sputum samples. The data for Truenat MTB-Rif shows similar accuracy to WHO-approved commercial line probe assays. The technology of this test have been endorsed by WHO
- Explored medicinal plants for anti-TB potentials against MDR Mycobacterium tuberculosis
- Identified overexpressed proteins in aminoglycosides resistant Mycobacterium tuberculosis proteins that might be of diagnostic importance for detecting aminoglycosides resistance.
- Proteomic analysis of contacts of leprosy cases for early diagnosis of leprosy
- Evaluation of the efficacy of potential medicinal plants in mice TB model for the development of adjunct anti-TB phytotherapy.
- The loop-mediated isothermal amplification (LAMP) technique for diagnosis of Female genital tuberculosis (FGTB) is being investigated.
- Investigation on cellular markers and their implications in detecting treatment efficacy of tuberculosis (DRDE Funds)
- Immune regulation in tuberculosis: unravelling the obscure roles of myeloid derived suppressor cells and regulatory T cells (DBT Funds)
- Role of MCP-1 gene polymorphism(s) in Mycobacterial Diseases (ICMR Funds)
- Study of TCR (T cell receptor) mediated T cell signalling events in systemic circulation and at the site of infection in TB pleurisy patients (DBT Funded)
- Understanding the role of ccl 2 and associated gene in leprosy susceptibility and in leprosy reactions (ICMR Funded)
- Comprehensive data on the prevalence of XDR among suspected MDR-TB patients and the clinical and demographical risk factors associated with the development of second line anti-TB drug resistance in Indian isolates of *M. tuberculosis*.
- "Programmatic implementation of MIP Vaccine Immunoprophylaxis for Leprosy"
- Currently four large scale and multicentric Global Fund projects including 'National Tuberculosis Prevalence Survey' are being executed.

- Demonstrated that dry powder inhalation containing Interferon- γ transiently transfected the lung epithelium of mice infected with Mycobacterium tuberculosis.This revealed significant decrease in bacterial survival following treatment.
- Demonstrated efficacy of mucus-penetrating-microparticles (MPP) combining the benefits of anti-TB drug with host defencepeptides(HDP). The inhalation reduced bacterial load and inflammation in lungs in a mouse model of TB in 6 weeks of daily dose.This could be beneficial for resistant TB therapeutics as an "adjunct" to existing DOTS therapy.
- Investigated safety and efficacy of macrophage-targeting dry powder inhalation of Isoniazid and Rifabutin in poly(Lactide) in mice model of tuberculosis. The drug encapsulating microparticles in combination with DOTS regimen is superior to DOTS alone in treatment of mouse model TB. The proposal forclinical trial is in process to evaluate its safety and efficacy in humans.
- Prevalence of tuberculosis infection and disease among pediatric household contacts of Multi-Drug Resistant tuberculosis patients-A multi centric prospective cohort study(ICMR-Task Force, Ongoing)
- Study Of Serum and Dermal Proteome Of Borderline Leprosy (BT,BL) In Relation To Therapeutic Changes Induced by chemotherapy and chemotherapy with immunotherapy(ICMR- Adhoc, Ongoing)
- Multicentric trial to study the effect of early active mobilization as compared to 3 weeks immobilization following tendon transfer procedures for claw hand (ICMR-Task Force , Completed)
- Noval static progressive splint design for pre operative domiciliary mobilization of ulnar claw hand-A pilot study.(Medical Innovation Fund-ICMR, Ongoing)
- Study of profile of deformity in new leprosy cases and to analyze predictive risk factors in the development and progression of the disability.(ICMR-NJILOMD,AGRA, Ongoing)
- Assessing the adherence of MDT in leprosy cases in recent five years.(ICMR-NJILOMD,AGRA, Completed)
- Prevalence of leprosy disease among pediatric house hold contacts of leprosy patients

ICMR- Regional Medical Research Centre for North East (RMRCNE), Dibrugarh

- Provided COVID-19 diagnostic services. Carried more than 2,15,000 tests based on real-time PCR through the Regional VRDL of the institute since March 2020 till date.
- Successfully conducted Phase 1,2 and 3 national COVID-19 serosurveys in 3 districts of Assam (Udalguri, KarbiAnglong&Kamrup-Metropolitan).
- Developed a regional depot in March 2020 to store and supply COVID-19 testing kits/ reagents to the designated real-time PCR laboratories in northeast India.
- Regional VRDL isolated the SARS-CoV-2 virus in the Vero-CCL-81 cell line (in the BSL-3 facility).
- Estimated the burden of tuberculosis in tribal populations of Nagaland, Meghalaya, Manipur and Tripura and disseminated the information among state health authorities besides creating awareness about tuberculosis in the tribal communities.
- A molecular epidemiological investigation of Mycobacteriumtuberculosis isolates from Tripura, Meghalaya and tea-gardens of Assam using NGS sequencing is also underway.
- National survey for the state-wise prevalence of microbiologically confirmed pulmonary tuberculosis in India (NE Component) is ongoing.
- Our centre serves as the Apex Reference Laboratory (ARL) for the Japanese Encephalitis (JE) virus.

- ICMR-RMRCNE Dibrugarh is leading a nation-wide multi-centric project to investigate human pulmonary paragonimiasis in fresh-water crab-eating communities and smear-negative pulmonary tuberculosis across multiple states of India.
- Enumeration of "the causes of death" in 45 clusters across four northeast India states (Tripura, Mizoram, Meghalaya and Sikkim).
- A Health and Demographic Surveillance System (Dibrugarh-HDSS) covering 60 adjacent villages and 60 tea-gardens from the Dibrugarh district of Assam has been established.
- A stroke registry has been established at Dibrugarh by RMRCNE. Further, the feasibility of a Stroke Clinical Care Pathway has been assessed using a mobile stroke unit in two blocks of Dibrugarh district.
- Innovative mobile-based applications (MoSQuIT and BHU-Health) introduced for real-time malaria surveillance in remote and inaccessible areas with international borders.
- Improved malaria surveillance and decreased malaria incidence in areas with Jhum Cultivators in Tripura through an intervention package for accelerated malaria control.
- RMRCNE developed mobile-based application software for hypertension intervention.
- Characterized spotted fever group rickettsiae causing pathogens - *R. asembonensis, Candidatus, rickettsiaesenegalensis*and *Rickettsia felis* in fleas for the first time in Northeast India.
- A diagnostic algorithm developed for identifying acute encephalitis syndrome (AES)aetiologies for NE states.
- Demonstrated spotted fever rickettsiae and typhus group rickettsiae, beside scrub typhus contributing to nearly 30% of AES case-loads in the north-eastern states.
- Role of climate change on seasonality and distribution of insect vector-borne viral and rickettsial diseases of northeast India studied using remote-sensing & GIS.
- Contributed to guidelines formulation by NVBDCP on empirical use of Doxycycline and Azithromycin for treating acute encephalitis syndrome (AES) cases in north-eastern states.
- Demonstrated the efficacy of administrating a single dose live-attenuated SA 14-14-2 vaccine in protecting against Japanese encephalitis among adults for at least six years.
- Determined the seroprevalence of *T. gondii* among women in the reproductive age-group in the tea tribes.
- Generated awareness on the prevention of sickle cell haemoglobinopathies in unmarried adults of the tea-garden community using IEC (Information, education and communication).
- Demonstrated the need for additional mop-up rounds in primary health centres to alleviate inadequate coverage, and compliance MDA highlighted.

ICMR-National Institute for Research in Tuberculosis, Chennai

- Initiated the first National TB Prevalence Survey across the country with a sample size of 5,00,000 population
- Initiated the Multicentric TB Vaccine clinical trial (VPM1002 and Immuvac Vaccines) for Preventing TB in 12000 Healthy Household Contacts of Newly Diagnosed Sputum Positive Pulmonary TB Patients. Completed the NIRT site enrolment to the trial.

- A study to validated the indigenous Made-in-India TB Diagnostic kit "Truenat" was completed successfully and received WHO approval for use in National TB Elimination programm
- Activities of Supra National Reference Laboratory for Mycobacteriology continued and during this period, Myanmar and Timor Leste were included
- Launched the whole genome sequencing with technical inputs from the collaborators and have a bioinformatics pipeline created that can predict drug resistance mutations and whole genome sequencing of the clinical isolates of mycobacteria for more than 1000 strain achieved.
- A phage lysin developed at NIRT was successfully patented by ICMR (Patent Number: 269659).
- Established method and validated drug susceptibility testing of newer anti-TB drugs like Bedaquiline and Delamanid by BACTEC MGIT 960 system for Mycobacterium tuberculosis
- Establishment of Regional Resource Centre for Health Technology Assessment in India (HTA-In) in ICMR-NIRT, Chennai
- National Accreditation Board for Testing and Calibration Laboratories (NABL) accreditation was granted to Bacteriology department of NIRT.
- CoVID-related activities
- COVID Regional Depot for Laboratory kits established
- COVID testing center created to support the State Government
- Two COVID related Vaccine studies planned and conducted – COVISHIELD vaccine and BCG vaccine to prevent COVID in elderly

National Institute for Implementation Research on Non Communicable Diseases, (Formerly Desert Medicine Research Centre), Jodhpur

- Early Detection of Breast Cancer Involving Strategic Education And Awareness Among Women in Rajasthan with an aim to strengthen state breast cancer screening programme and develop a referral system for diagnosis and treatment of suspected cases at state medical colleges/ District Hospitals.
- Screening of tribal residents for Sickle Cell Anaemia (SCA) and intervention through Information Education and Communication (IEC) was carried out in two blocks i.e.Kotrablock of Udaipur District and Sajjangarh block of Banswara District. A total of 7100 students have been screened from Kotra Block and 1215 (17.11%) students were carrying sickle cell trait and 29 (0.41%) students having sickle cell disease.
- Multi-component health & nutrition education intervention was provided to 5000 households including lactating women, infant 1 to 5 years children and adolescent girls to improve health and nutritional status.
- Clinical &Nutritional assessment of the elderly population; assessment of micronutrient deficiencies viz Iron, zinc, vitamin A and E, Ca, Se and analysis of blood sample for lipid profile of 400 elderly population &developed intervention model in collaboration with local medical college, health system and ICMR. Intervention model showed positive significant impact on risk of malnutrition & decline in Serum Ca (53.6 to 37.4%), Hypertriglyceridemia & Low HDL.
- IEC modules prepared for the promotion of three local pearl millet preparations to improve the Pearl Millet consumption among the rural population of Nagaur district of Rajasthan.
- As a part of the ICMR multi centred study, NIIRNCD assured sero-prevalence of dengue, chikungunya and Japanese encephalitis virus infection in Rajasthan. Among the samples 55.8% were positive for dengue IgG and 2.36% were equivocal.

- A total of 25,258 women from Jalore, Pali and Jodhpur districts have been covered and information about awareness about signs and symptoms and risk factors of breast cancer were collected. A total of 17,529 women have also been imparted training for breast self examination. A total 229 suspect cases of Breast Cancer have been identified and cases have been recommended to consult PHC Medical Officer.
- The sickle cell anemia screening work was being carried out jointly with Medical & Para medical staff of State Medical & Health Department, Udaipur. Total 36709 individuals have been screened so far out of which 4949 (13.48 %) individuals found confirmed positive cases.
- A total of 947 and 620 households covered in JamwaRamgarh and Chomu block, of Jaipur district for the Consumption pattern of food and food products/items high in fat, salt and sugar. Intervention was provided them to take local food with high nutritional value.
- Bacteriologically confirmed PTB cases in severely malnourished children admitted to Nutritional Rehabilitation Centres were recorded.
- Assessment of Iodine status of 225 pregnant women in Jaisalmer District was recorded in first trimester and being followed. Around 860 blood samples and 698 urine samples of pregnant women and 805 salt samples from their houses have been collected and analysed. 44.9% pregnant women of 3rd trimester were Anemic&11.8% were suffering from Severe Anemia. 28.5% were deficient in Urinary Iodine concentration whereas 51.2% of the households used salt which was adequately iodized.
- IEC modules prepared for the promotion of three local pearl millet preparations to improve the Pearl Millet consumption among the rural population of Nagaur district of Rajasthan.
- Awareness about signs and symptoms and risk factors of breast cancer were collected from 69,616 women (30-65 years) from Jalore, Pali and Jodhpur districts
- Screening of 83000+ (6-21 age group) population was done for sickle cell anemia and overall prevalence was 11.5% with highest among Garasia tribe. All the individulals screened were provided Sickle Cell status Cards.
- The screening of neonates was carried out at Kotda and Jhadolblocks of Udaipur District of Rajasthan and 829 newborns were tested for various hemoglobinopathies.
- Under the National TB prevalence Survey, 5 clusters covering 3640 registered participants were completed. 12 cases of active tuberculosis were detected during this survey period.
- Burden of TB among the tribal population was estimated and an innovative health system model developed to strengthen TB control in the tribal areas of Rajasthan. Twenty five new PTB cases among the tribals were detected by the motivation, screening and referral activities undertaken by innovative health system developed in collaboration of health system, tribal department, women and child development department and local volunteers.
- Screened about 350 miners; and 12% of them have respiratory symptoms; and a total of XRay chest done so far have suggested even asymptomatic cases can be picked up by XRay chest under the study early diagnosis & development of a referral system for silicosis among sandstone miners.
- Validated the Truenat real-time microPCR system for diagnosis of H1N1 (swine flu) for the Government of Rajasthan.
- Use of point of care technology Cardiotocography in MRHRU and its interpretation from experts of SMS Medical College, Jaipur through WhatsApp has been executed and found to be effective and life saving for rural population. Use of point care technology for the detection and treatment of H1N1 and Tb has been found to be effective in rural setup.
- Setting up of Covid-19 RT-PCR Testing Facility :

- Round the clock testing facility started functioning from April 18 2020
- Trained 50+ staff in COVID-19 testing methods
- Tested over 2 lakh samples so far.
- Turn around time from reception to reporting : - <24 hours
- Samples were provided by state health authorities from Jodhpur, Jalore, Kota, Bundi, Baran, Jaipur, SawaiMadhopur, Karauli, Bharatpur districts
- Setting up of Covid-19 Testing Kits Validation Centre
- Designated as COVID-19 kit validation centre on 4th June 2020
- Validation of 100 kits completed till date
- Average turn around time of around 48 hours is one of the fastest among all the validation centres in our country

ICMR-National Centre for Disease Informatics and Research (NCDIR), Bangalore

- The Report of National Cancer Registry Programme, 2020 provides data on cancer incidence, mortality, leading sites and clinical data, the report also includes detailed anatomic site-specific data for some leading cancers- breast cancer, cervical cancer, head and neck cancer, cancer of the lung and stomach and projected number of cancer cases till 2025.
- Report on the project "Development of an Atlas of Cancer in Haryana: 2016-17" provided district wise cancer statistics for Haryana.
- The Report of 'Profile of cancer and related health indicators in the North East Region of India, 2021' provides state wise cancer statistics for all the 8 NER states. It is a useful report for advocacy for investing in cancer control, which is the highest in the country
- 5 Population and 20 Hospital Based Stroke Registries are in place across the country in medical colleges to provide vital information on stroke incidence, mortality and burden. Treatment and survival of stroke patients will be measured for efforts to improve outcomes.
- Heart failure registries have been set up in 5 hospitals across the country to collect data on patterns, causes of heart failure, treatment outcomes and survival.
- The electronic mortality (NCDIR e-Mor) software developed by the software team at NCDIR would strengthen the medical certificate of cause of death (MCCD) with features to generate MCCD and Death report (Form 4 and 2 respectively) to aid in death registration. The software has been deployed in 18 hospitals in North Eastern States, and other 21 centres across the country. Many state govt collaborations are in progress.
- Guidance document for appropriate recording of COVID-19 related deaths in India was developed to ensure the correct reporting of deaths due to COVID-19 in May 2020
- The Report of "National Noncommunicable Disease Monitoring Survey 2017-18" was released on 25th January 2021. It is the largest NCD survey in the country to measure progress of the country towards achieving the national NCD targets.
- An e book on "Framework for Telemedicine use in Management of Cancer, Diabetes, Cardiovascular Diseases, and Stroke" was released on 25th January 2021. This will aid delivery and use of telemedicine across all health facility settings.
- Designation of ICMR Bioethics Unit, ICMR-NCDIR, Bengaluru as WHO Collaborating Centre for Strengthening Ethics in Biomedical and Health Research on 7thFeb, 2020. It is the first centre for strengthening research ethics amongst 11 countries of the South East Asia Region of WHO.

- ICMR National Guidelines for Ethics Committees Reviewing Biomedical & Health Research during Covid-19 Pandemic was released in April 2020.
- The Standard Operating Procedure (SOP) template for the Ethics Committee for the conduct of ethics review in an emergency situation was prepared.
- ICMR Policy on Research Integrity and Publication Ethics (RIPE) were prepared to ensure highest professional and ethical standards for biomedical and health research at all stages for the benefit of population and provide a roadmap to overcome / eliminate any sort of misconduct. The policy was released on 30th July 2019.
- ICMR Consensus Guideline on 'Do Not Attempt Resuscitation (DNAR)' was prepared and published in Indian Journal of Medical Research and National Medical Journal of India simultaneously. The position paper would guide the treating physicians to take this decision when the patient's chances of survival are extremely low and to preserve the dignity in death by avoiding medically nonbeneficial CPR while providing compassionate care.
- Release of ICMR Handbook on National Ethical Guidelines for Biomedical and health Research on 26th March 2019.
- The "Common EC forms for ethics committee review" were released at NCDIR on 7th December 2018.
- Dissemination Report (2017-2019): A consolidated report on dissemination and training programs on ICMR National Ethical Guidelines conducted by ICMR Bioethics Unit, NCDIR, Bengaluru across the country during 2017-2019 to reach out to maximum possible stakeholders was released on 12th February 2020.

ICMR - National Institute of Epidemiology, Chennai

- Master of Public Health and Master of Applied Epidemiology: Contributed towards strengthening field epidemiology capacity in the country, with a 2-year training of >300 public health managers from 26 Indian states
- EIS India (South): Initiated EIS India (South) and NCD Fellowship program for in-service candidates
- Online courses:
  - Health Research Fundamentals: Through 11 cycles, trained more than 40,000 researchers on fundamentals of research methodology.
  - National Medical Commission has made NIE's Basic Course on Biomedical Research, as a mandatory course for postgraduate medical students
  - Ethics Review of Health Research: Launched online program for Ethics committee members and Researchers
- Generated data about endemicity of dengue virus infection in the country to inform decision about introduction of dengue vaccine
- Generated disease burden data about Chikungunya, Hepatitis B virus infection and diphtheria immunity.
- Established surveillance for bacterial pneumonia to study serotype profile of S. pneumoniae including serotype switch following introduction of PCV
- Established surveillance for congenital rubella syndrome to monitor progress towards rubella/CRS elimination.
- Regional institute for HIV sentinel surveillance in 7 southern states

- Completed a survey in 19 States to verify the elimination of mother to child transmission of syphilis and HIV.
- Conducted serosurveys to document the impact of measles/rubella mass vaccination campaigns on population immunity
- Coordinated the implementation of mission mode project to improve hypertension control in >60 districts.
- Verified Sub-national claims for progress towards 'TB Free' status in 73 districts in India
- Assessed impact and operational feasibility of TrueNat under RNTCP in Andhra Pradesh
- Evaluated the role of convalescent plasma in management of severe COVID-19 patients (PLACID Trial)
- Coordinated the conduct of three nationwide COVID-19 serosurveys
- Working closely with governments of Tamil Nadu, Puducherry in response to COVID-19

ICMR-National Institute for Research in Reproductive Health (NIRRH), Mumbai

- Our Intervention studies carried out in tertiary hospitals of Mumbai and district hospitals in Maharashtra assessed the effectiveness of a HIV-Family Linkage strategy to reduce unwanted pregnancies among People Living with HIV (PLHIV) by promoting use of dual methods for contraception.
- ICMR-NIRRH conducted studies to implement the MNM guidelines released by Government of India. Our study demonstrated that the leading causes of MNM were Hemorrhage (36.4%) and Hypertensive disorders of pregnancy (30.3%).
- Studies carried out at the Health Technology Assessment (HTA) Resource Hub at NIRRH established in 2017 demonstrated that that adding a new contraceptive such as Nexplanon can be cost-effective and this in turn can enable policy makers to make a decision to bring the new contraceptive into the program.
- Indigenous kits were developed to assess bone health.
- NIRRH contributed to the Global Research Policy on the Priorities of endometriosis research in low resource settings and generated evidence on the feasibility and practicality of WERF EPHect research instruments for endometriosis research in India
- Implementation of Standard Treatment Guidelines on snakebite management resulted in reduction in incidence of snakebite, reduction in case fatality rate from 4.4 % to 0.4% at Dahanu block of Palghar district in Maharashtra.
- Studies were conducted to investigate whether the Involvement of Self Help Group (SHG) women can improve health seeking behavior of tribal women. The study suggests that the potential of SHGs could be utilized to address reproductive morbidities as they have good rapport with community.
- Low PlGF (placental growth factor) levels in the urine in third trimester of pregnancy were found to be associated with the low birth weight of the baby.
- Paternal epigenetic factors were identified for their role in recurrent pregnancy loss.
- As response to COVID-19 pandemic, NIRRH functioned as:
  - Regional and central depot for storage and distribution of diagnostic kits

- Testing and reporting center for samples received from MCGM and State Hospitals
- Centre of Excellence for validation and quality assurance for reagents (VTM, RNA extraction and RT-PCR kits) related to COVID-19 testing
- Biorepository of samples from COVID-19 patients.
- Our study suggested that mother-to-child transmission of SARS-CoV-2 is possible.
- The institute launched national PregCovid Registry in collaboration with Medical Education and Drugs Department and Health Department, MCGM, Mumbai.

ICMR-National Institute for Research in Environmental Health (NIREH), Bhopal

- Data triangulation to understand status of gas exposed survivors of Bhopal
- Effectiveness of institutional versus domiciliary implementation of standard pulmonary rehabilitation module in Bhopal gas exposed survivors having COPD
- Development and Validation of a mito-epigenetic carcinogenic risk assessment model for environmental chemical exposures: A Pilot Study
- Aberrant circulating epigenomic signatures: development and validation of minimal-invasive biomarkers for transgenerational monitoring of air pollution associated cancers
- Development of quantum dots-based nano-biosensors for detection of circulating cell-free miRNAs in environmental associated lung carcinogenesis Indo-Russian
- Characterization of prevailing chronic respiratory morbidities among severely gas exposed population of Bhopal
- Prevalence of Chronic Kidney Disease in severely exposed cohort population in Bhopal
- Linking and analyses of existing ICMR Databases (1985-2015) of epidemiological and genetic studies of Bhopal gas victims
- Non-invasive assessment of inflammatory biomarkers in adults exposed to long-term traffic related air pollution
- Delineating the role of micro RNAs in mediating transcriptional alterations during Arsenic-induced hepatocellular carcinogenesis
- Evaluation of impact of anti-retoroviral therapy under National AIDS Control Programme in India
- Development of aptamer-based sensing techniques for the detection of Delta-Aminolevulinic Acid, a biomarker of effect in Lead Toxicity
- An exploratory study on the potential of circulating micro RNAs as minimally invasive effect biomarkers of Polycyclic Aromatic Hydrocarbons exposure
- National Environmental Health Profile study.
- A cross sectional study on current health status of gas affected individuals of Bhopal. Phase-II Data Triangulation to understand health status of Gas exposed survivors of Bhopal.
- A pilot study on health effects of simultaneous exposure to multiple heavy metals in two different settings of Bhopal. Phase-I assessment of heavy metals in the ground water from a solid waste disposal site and an industrial area in Bhopal

- Estimation of indoor air toxicants and associated health effects on human in Bhopal area and development strategy for their mitigation
- Effects of noise pollution on brain activity and its correlation with neurological and mental health
- Investigation on drinking water as a potential source of endocrine disrupting chemicals (EDCS) to human : an exploratory study in MP
- Density mapping and characterization of non-communicable disease related built environment attributes in urban slums of Bhopal
- A genomic and metagenomic insight into the anthropophilicbehaviour in Aedesaegypti, a highly efficient arboviral disease vector
- Assessment of micro-climate variation on the population dynamics of dengue vector using a landscape genetics approach in an urban landscape

ICMR-National Institute of Traditional Medicine, Belagavi

- Established a COVID-19 RT-PCR Testing state-of-art laboratory with the help of the Government of Karnataka to provide the service to the people of Belgaum and its neighboring District(s) during unprecedented pandemic, since April 22, 2020. Till date the ICMR-NITM have tested 1.53 lakh samples to-date, including the migrant laborers. Further, we have provided training and expert guidance to the Laboratory staff of State Government.
- Developed and released the Biosafety and Biosecurity Manual for COVID-19 RT-PCR testing for the benefit of health and Science community.
- ICMR-NITM have sequenced whole genomes of two SARS-CoV-2 isolates from acute COVID-19 patients of Belagavi District that harbour D614G mutations. The work was published in Microbial Resource Announcements of the American Society for Microbiology, and featured in the Cover Page of the Journal, only one from India (Microbiology Resource Announcements 2021; 10(6): e00016-21. doi: 10.1128/MRA.00016-21).
- A terpenoid compound isolated from a plant NITM_159 showed dose-dependent significant anti-hyperglycaemic potential comparable to glibenclamide.
- A traditional formulation of essential oil from Mammeasuriga flower buds, showed significant diabetic wound healing activity in vitro; and in-vivo studies is in progress.
- Analgesic and anti-inflammatory activities of Plumbagozeylanica root paste, which is a traditional practice for joint pains was clinically evaluated in osteoarthritis patients.The formulation is found safe for application (as evidenced by hematological parameters, RFT and LFT) and also found to be effective in reducing pain and inflammation(as evidenced by VAS Score for pain, WOMAC Osteoarthritis Index, walking speed test, tenderness of knee joint, knee joint circumference and range of movements of knee joints). The practice is in the process of translation to product development.
- Identifying hydro alcoholic extracts of Cyperusrotundus and Saracaasoca and their combinationsfor their anti-obesity effect, which supports the traditional use of these plants in obesity and metabolic disorders.
- An Ayurvedic formulation developed by CCRAS (AYUSH PJ-7)for the Management of Dengue Fever & Prevention of its complications was evaluated for its add on efficacy and safety in a Phase III, Double Blind, Placebo Controlled, two arm study. The study is completed and the analysis of results is in progress by CCRAS.

- Immune responses against HSV are delicate interplay between innate and adaptive system. Innate response induces protective IFN-1; while NK and pDC confer in vivo anti-HSV response via humoral and cellular path to control infection and latency. Metabolic changes lead to up-/down-regulation of cytokines and chemokines like IFN-γ, IL-2, IL-4, IL-10, and MIP1β during infection or recurrences. While viral ICP0 as an attenuator of TLR signalling can inhibits innate responses. Further, the pathogen recognition TLR receptors, DNA and RNA sensors, IFNs, and interferon-stimulated gene (ISG) expressions are changed when astrocytes are infected with HSV-1F. We observed upregulation of TLR-2, 6, 9, MDA5, and DAI with increased IFN-I and interferon-stimulated genes IFIT1, IFIT3 and RNase L that encodes the antiviral immune response mediated proteins (Archives of Virology164(5): 1433-1439, 2019; Viral Immunology2020. doi:10.1089/vim. 2020.0238).
- High prevalence of Goitre in 6-12 year old school children in rural areas of North Karnataka was flagged through the surveys carried out by various Medical Colleges in the region.
- A herbal paste, used by local traditional practitioner of the region for the treatment of joint pains in general, is identified as a lead for further clinical trials.
- A decoction of leaves of a plant RMRC-BM IP_156, a lead from a local traditional practitioner for the management of type 2 diabetes, showed good anti-hyperglycaemic activity in chemically induced diabetic rat model.
- A point-of Care antibody lateral flow test has been developed for assessing the exposure to filarial infection which will be useful in the Transmission Assessment Survey for filariasis, under filariasis elimination programme.
- This translational extramural project was submitted in Dec 2014 in response to a call from the DG from ICMR-Virus Unit, and was sanctioned in March 2017 at RMRC Belgaum. The safety study conducted at RMRC Belgaum revealed that MH-7 is non-toxic upto 50 mg/Kg in mice. Further, the cutaneous model in Balb/C mice was developed with HSV-1F and clinical isolate VU09 (HSV-1) following previously standardized method (Antiviral Research 105: 126-134, 2014), and a topical formulation was developed with M/S Parker Robinson for pre-clinical trial. The project was withdrawn in October 2017 by the ICMR.
- Identified Cocoa (seeds of Theobroma cocoa L.) extract effective against adverse effects of Doxorubicin.The study demonstrated that, hydroalcoholic extract of cocoa ameliorates the DOX induced cardio-, renal- and hepato- toxicity in rats, which holds promise to help patients undergoing cancer therapy with Doxorubicin.
- Preclinical toxicological and pharmacological evaluation of selected traditional herbal medicines and their ingredients (Sauropus androgynous, VernoniacineriaandHygrophilaauriculata) established their safety levels for use.
- The ICMR-NITM was a part in the study on 'Immuno-epidemiology of lymphatic filariasis with reference to exposure to filarial infection in endemic regions of Karnataka, with and without on-going transmission' as a part of LF elimination programme.
- Development of rapid point of care immunological and molecular diagnostics for lymphatic filariasis validated in three stages viz., 1) Specificity against sera of patients with helminth, protozoan, bacterial and viral infections, 2) Sensitivity using sera filariasis patients and non-endemic individuals, and 3) Field utility using field collected sera samples from LF endemic areas.
- Two identified lead plant species code named RMRC-NTD- M1 and RMRC-NTD-M2, traditionally used in the treatment of malaria, through target based approach.
- Working on optimising forest benefits whilst minimising impacts of Kyasanur Forest Disease and other zoonotic diseases.

ICMR-National AIDS Research Institute (NARI), Pune

- HIV outbreak investigation in the district of Unnao, Uttar Pradesh (UP) was successfully carried out by the Scientists of ICMR-NARI. The results of this investigations helped in suggesting appropriate intervention measures to Uttar Pradesh State AIDS Control Society (UPSACS).
- ICMR-NARI extended support to activities pertaining to management of Nipah virus outbreak in Kerala.
- Countrywide assessment of the Impact of Anti-Retroviral Therapy (ART) was carried out by the Scientists of ICMR-NARI. This highlighted the role of ART in reducing HIV infections in the country and also opportunistic infections such as Tuberculosis among People Living with HIV (PLHIV).
- CD4 count and viral load estimation related external quality assurance services were provided by ICMR-NARI to different laboratories across India.
- HIV drug resistance genotyping in and outside the country (Nepal, Srilanka and Maldives) was conducted by ICMR-NARI.
- Investigation around Acute Encephalitis Syndrome (AES) in Gorakhpur, UP was successfully carried out by ICMR-NARI which helped informing intervention development.
- Bio markers in dried blood spots for elderly population under Longitudinal Ageing Study in India (LASI) were identified by ICMR-NARI.
- Consortium activities of the National Reference Laboratories (NRLs) for Kit Quality Testing to support the National AIDS Control Programme and external quality assurance for HIV-1 viral load testing were carried out by ICMR-NARI.
- ART Centre operated by the scientists of ICMR-NARI at Pune Municipal Corporation (PMC) area catered to a total of 3557 PLHIV for active care. This activity is supported by National AIDS Control Organization.
- Saliva based HIV self-screening test was assessed by Scientists of ICMR-NARI. This investigation was conducted to help achieve the National target where 90% of PLHIV would require knowing their HIV status so that they could be linked to appropriate ART services.
- Ocular manifestations among ART centre attendees were described by ICMR-NARI, which could generate information for intervention development.
- ICMR-NARI as a Regional Institute supervised implementation of India's HIV SentinelSurveillance (HSS) at 12 Central prisons in 4 states within western part of India.
- ICMR-NARI supervised Behavioral Sentinel Surveillance – Lite (BSS-Lite) in Rajasthan, Maharashtra and Gujarat among Female Sex Workers (FSWs), Men having sex with men (MSM), Hijra/Transgender People (H/TG) and Injecting drugs users (IDUs).
- ICMR-NARI developed HIV-1 viral load proficiency testing panel for 42 laboratories under the national programme across India.
- ICMR-NARI validated HIV-1 Dried Blood Spots (DBS) Viral Load assay for the national programme.
- Following investigations were initiated at ICMR-NARI in relation to COVID-19 pandemic:
    a) WHO-India (ICMR) Solidarity Trial was initiated to generate information on appropriate treatment modalities.
    b) Serum panels were developed by the Scientists of ICMR-NARI for validation of IgM and IgG COVID-19 kits.
    c) COVID-19 tele survey was conducted to identify social drivers of acceptance and rejection of protective measures against SARS-CoV-2 infection in the community.
    d) A mixed method study was conducted to identify factors related to COVID-19 stigma.

e) The Scientists of ICMR-NARI validated dry swab RNA-extraction-free method based diagnostic test for SARS-CoV-2 compared with the standard VTM based swab collection method.

f) Three rounds of population-based sero-surveillance for SARS-CoV-2 infection transmission were completed in six districts of Maharashtra.

- The demonstration project to study the feasibility of oral TDF based Pre-Exposure Prophylaxis (PrEP) among men having sex with men (MSM) and transgender women (TGW) was initiated by ICMR-NARI.
- ICMR-NARI is the nodal Institute for implementing the National Tuberculosis Prevalence Survey in 57 clusters for Maharashtra and Goa.
- ICMR-NARI is the nodal Institute for implementing the India Hypertension Control Initiative (IHCI) – an implementation cum research project in Maharashtra and Goa.
- ICMR-NARI completed enrollment of 1593 participants against revised target of 1600 under the TB Vaccine Trial.
- In accordance with the scale up of the Viral Load testing facility by the programme, HIV-1 viral load EQA panel (2nd round) was developed by ICMR-NARI independently using an Indian isolate. It is ready for distribution to 60 viral load testing laboratories in the public sector covered under the national programme as well as to CDC, USA (for quality assurance).
- ICMR NARI has been identified as western regional communication hub by the ICMR headquarter.
- Scientists of ICMR-NARI validated a total of 54 COVID-19 serological test kits for detection of SARS-CoV-2 – specific antibodies.
- Scientists of ICMR-NARI validated a total of 15 RT-PCR test kits for the detection of SARS-CoV-2 in the clinical specimens.

ICMR- Regional Medical Research Centre, Port Blair

- Eliminated diurnally subperiodic W. bancroftifilariasisamong Nicobarese tribe in Nancowry group of islands through implementing supply of DEC fortified salt , a novel strategy as a supplementary to ongoing MDA .
- Health and nutritional profile of particularly vulnerable tribesviz.,Jarawa,Onges, Andamanese and Shompen were updated with the results of recent surveys among them. The recommendations were provided to authorities for better implementationof supplements.
- A statistical model of Anopheles breeding risk based on physico-chemical parameters of the habitats was developed towards the control of vector borne diseases .
- A major projects was initiated to eliminate Tuberculosis among indigenous Nicobarese tribes from Car Nicobar Island .
- Developed a model of Anopheles mosquito breeding parameters and their Physico-chemical determinants and application of the model for environmental monitoring of risk to Anopheles breeding in the context of Global Climate Change .
- ICMR -RMRC providing diagnostic support on suspected diseases with viral etiology to all health care facilities of islands under State Level Viral Research and Diagnostic Laboratory - Establishment of a Network of Laboratories for Managing Epidemics and Natural Calamities
- World Congress on leptospirosis was organized at the Regional Medical Research Centre at Port Blair, during 18th-19thNovember, 2019, with a theme "Leptospirosis - climate change and the changing epidemiology-opportunities opened up by new insights into genomics & vaccines". A total

of 23 International experts across the world representing from 11 countries and 52 Indian experts attended the Congress .

- Conducted the external Quality Assurance program – molecular (RT-PCR) and serological (IgM EIA) diagnosis of Leptospirosis at thirty DHR- ICMR Virus Research and Diagnostic Laboratories across the country to facilitate the initiation of specific therapy at early stage towards the prevention and control of leptospirosis .
- ICMR – RMRC act as Nodal laboratory for SARS CoV 2 and extended the diagnostic support since 11th March 2020to all health care facilities in Islands under DHS and Indian Naval Hospital (24h X 7d). The first common source outbreak of SARS CoV 2 was investigated in collaboration with DHS in March 2020. Pool testing for SARSCoV 2 was first time conducted at RMRC in India .Thousands of positives were identified .
- ICMR -RMRC evaluated a TruenatTM- Micro real time-PCR for rapid diagnosis of leptospirosis at minimal resource settings.

ICMR- Regional Medical Research Centre (RMRC), GORAKHPUR

- Foundation Stone of ICMR-RMRC Gorakhpur was laid on 2nd Sept 2018 by Hon'ble CM of UP in the presence of HFM. Construction is ongoing in full swing.
- Establishment of AES cell in BRD Medical College Gorakhpur for early diagnosis and treatment of JE/AES.
- Demonstrated the risk factor for acquisition of scrub typhus infection in Gorakhpur
- Demonstrated the effectiveness of presumptive treatment of acute febrile illness with Doxycycline/ Azithromycin in preventing Acute Encephalitis Syndrome in Gorakhpur
- Conducted two-day workshop on Biomedical communication
- Initiated Health & demographic surveillance system in Gorakhpur covering 28 villages
- Initiated the National Survey for state wise prevalence of microbiologically confirmed pulmonary tuberculosis in India in eastern Uttar Pradesh
- Organizing health awareness camps in endemic villagesof JE/AES in Gorakhpur division.
- Organized ICMR Training on Biomedical and Health Research Ethics
- Signed a Memorandum of Understanding (MOU) with DDU Gorakhpur University to develop academic exchanges and cooperation in teaching and research
- Organized a Stake holder's consultation on AES/JE with state health officials to focus research work on regional health issues.
- Established the First laboratory for COVID-19 diagnosis in Eastern Uttar Pradesh
- Tested over 3.5 lakh samples for COVID-19
- Established BSL-2 Plus facility for emerging pathogens
- Contributed in three national sero-survey of COVID-19 in eastern Uttar Pradesh
- Carried study to assess the impact of COVID-19 on Maternal & child health care services in eastern Uttar Pradesh
- Carried study to assess stigma related to COVID-19 in eastern Uttar Pradesh
- Upgraded to Apex Referral laboratory (ARL) for AES/JE by NVBDCP
- Recognised as Sentinel Surveillance Hospital (SSH) for Dengue & Chikungunya by NVBDCP
- Completed baseline Health demographic surveillance of 28 villages covering 1.2 lakh people.

- Selected for the establishment of state level VRDL
- Leading partner in Health Purvanchal initiative of Govt of Uttar Pradesh

ICMR-National Institute of Immuno hematology (NIIH), Mumbai

- Established 'Satellite centre for Hemoglobinopathies at Chandrapur' which is providingcomprehensive diagnostic facilities for hemoglobinopathies
- Sanction of "Centre for Research, Management and Control of Hemoglobinopathies" at Chandrapur. It is expected to be completed in June 2021.
- Initiated mutlicentric new born screening program for sickle cell disease (SCD).
- Initiated antenatal screening for hemoglobinopathies and new born screening program for 5 treatable diseases at Nadurbar, an aspirational district in Maharashtra from 2019 under DBT UMMID initiative.
- Established 'Centre of excellence for advanced research in immunohaematology and transfusion medicine and create a national rare donor registry' at ICMR-NIIH in 2019
- Established 'Centre of Excellence for diagnosis, management, and research of Primary Immune-deficiency disorders' in 2017.
- Initiated mutlicentric project on 'A mutlicentric study on Systemic Lupus Erythematosus (SLE) from the North Eastern (NE) Region of India: Early diagnosis to research potential for understanding disease' involving five centres in NE region which aims at capacity building in the area of autoimmune diseases including establishing diagnostic facilities and also carry out research projects in the area of Systemic Lupus Erythematosus (SLE) patients.
- Initiated mutlicentric project on 'Development of cost effective indigenous reagent red cell panels for identification and characterization of blood group alloantibodies in North east India' involving four centres in NE region
- Initiated fellowship in 'Clinical genetics' for in-service clinicians aimed at focused training in the diagnosis of various inherited haematological and immunological disorders under DBT UMMID initiative.
- A rapid, cost-effective and simple gold nanoparticle-based lateral flow immunoassay based point of care (POC) test has been developed for the diagnosis of severe Haemophilia A and von Willebrand disease (International PCT application Number PCT/IN2020/050260- PCT-2014). The test is highly specific and sensitive with the working cost being <Rs 50.
- An in-house lateral flow immunoassay (LFIA) based POC test using gold nanoparticle labelled antigens/ antibodies for detection of COVID-19 IgG/ IgM antibodies was developed by ICMR-NIIH and has been transferred to TransAsia for commercialization.
- A simple gold nanoparticle-based lateral flow immunoassay based test has been developed for the point of care diagnosis of Glanzman'sthrombasthenia (GT)that can offer the diagnosis of a severe GT within 15 minutes of sample application. It has been sent to ICMR for applying for patent.
- Prepared 'Training Manual for Hemoglobinopathies and Hemophilia' with Blood cell- Ministry of Health and Family Welfare, Government of India.
- Specialized diagnostic services are provided by different departments including transfusion medicine, hematogenetics, hemostasis and thrombosis, paediatric immunology and leukocyte biology, cytogenetics, and clinical and experimental immunology. More than 20,000 patients from India and abroad have availed these diagnostic facilities.

- The Institute offers prenatal diagnosis for various inherited disorders to couples referred from different parts of the country and more than 300 affected families take advantage of these services every year

ICMR- National Institute of Cancer Prevention and Research, Noida

- A "Population Based Cancer Registry covering GautamBudh Nagar" to capture incidence and mortality of cancer in rural and urban population of GautamBudh Nagar (G.B. Nagar) district of Uttar Pradesh was set up.
- The WHO FCTC Global Knowledge Hub on Smokeless Tobacco at NICPR published a comprehensive report on the "Global Smokeless Tobacco Control Policies and their Implementation", first ever document of the global progress in implementing smokeless tobacco control policies.
- Establishment of Apex-level National Tobacco Testing Laboratory (NTTL) at NICPR to provide analytical facilities and advisory for tobacco and tobacco products. The NTTL has been notified in the Gazette of India on 5th September, 2019 by Ministry of Health and Family Welfare, Govt. of India.
- A special issue of the Indian Journal of Medical Research on Smokeless Tobacco was published.
- MoHFW recognized NICPR as Nodal Centre for training of various cadres of health workers in cancer screening.
- International meeting on Tobacco advertising, promotion and sponsorship (TAPS) ban 6-7 Nov 2019, four SEAR countries and high burden Indian states.
- Analysis of pan masala samples at NTTL-NICPR and reporting of the presence of nicotine in the samples from Bihar. This evidence was used by the states of Bihar, Rajasthan, Maharashtra and Uttarakhand to ban Pan Masala including storage, distribution and sale under Food Security Act, 2006.
- Publication of White paper on Electronic Nicotine Delivery System (ENDS) describing its addictive potential and threat to the country's tobacco control laws and on-going tobacco control programmes. This led to the promulgation of the Prohibition of Electronic Cigarettes (production, manufacture, import, export, transport, sale, distribution, storage and advertisement) Ordinance, 2019 in India
- Indo-African workshops conducted by various divisions for capacity building of African researchers/ medical practitioners in related disciplines.
- Division of Molecular Diagnostics of NICPR is recognized for Evaluation of In-vitro diagnostic Medical devices for Cancer (Cervical cancer/HPV diagnostics) under the Medical Devices rules 2017, CDSCO since 13th September 2019
- ICMR-NICPR has been accredited as National Training Centre for Colposcopy by the Indian Society of Colposcopy and Cervical Pathology (ISCCP) in April 2019
- NICPR established a High Throughput Viral Diagnostic facility for COVID 19 testing which is the country's largest laboratory and was inaugurated by the Honorable Prime Minister. During peak pandemic the lab was carrying out 9000-10,000 RT PCR tests a day. Till date, the lab has carried out more than nine lakh tests.
- Participated in three rounds of National sero-surveillance surveys to monitor the trend of SARS-CoV-2 infection transmission in India in districts of Uttar Pradesh and Delhi.
- NICPR drafted a document for comprehensive ban on SLT products (manufacture and sale) along with ban on their use and spitting in public places for containing COVID 19 pandemic. The Union Home Ministry took cognizance of this issue and in its consolidated revised guidelines issued on 15th April for containment of COVID-19 pandemic declared the act of spitting in public places a punishable offence with a fine under Section 51 (b) of the Disaster Management Act 2005. Twenty states and one

Union Territory also issued orders to ban of use of smokeless tobacco products and spitting in public places for containing COVID-19 pandemic.

- NICPR established COVID 19 testing facility using RT PCR at LehLadakh in May 2020.
- NICPR also facilitated setting up of High Throughput RNA extraction machines at Chandigarh, Ahemdabad and Chennai.

ICMR- National Institute of Pathology, Delhi

- Causes of childhood mortality are being established with the minimally invasive tissue sampling technique (MITS) in urban (New Delhi) and tribal areas of Maharashtra (Melghat). The cohort is being expanded to NE states of India.
- Pregnant women occupationally exposed to pesticides in tea gardens showed a decreased acetylcholinesterase (AChE) activity and was associated with an altered placental structure and low birth weight.
- Exploratory omics studies have revealed biomarkers for prognosis, diagnosis and surveillance (BIRC5 and SPP1 for bladder cancer, Neprilysin and autoantibody levels against ANXA1 for early stage GBC). The sensitivity and specificity are being established with larger cohort on wider disease states.
- Estimation of Circulatory 2-Hydroxyglutarate levels were found to decrease after surgery of gliomas. Its role in monitoring of treatment responses and disease recurrence is being explored.
- Over-expression of lnc-RNA MEG3 reduced the proliferation in Breast cancer cell lines and may find a use in therapeutics.
- IL8/CXCR1/2 signalling pathway is established as promoting tumor cell proliferation, invasion and vascular mimicry in glioblastoma. Antagonist of this axis is being explored as an adjunct to conventional anti angiogenic therapy in GBM.
- Leish LAMP- a low cost, field deployable, molecular diagnosis tools for application in endemic area was established and useful for surveillance of VL PKDL and asymptomatic VL in elimination settings. Indian patent no.327506
- Established the combination therapy based on Liposomal amphotericin B and MIL for treating Post kala azar dermal leishmaniasis (PKDL). This was found efficacious and safe, with no relapse and high tolerability.
- Developed a LAMP assay for a rapid and accurate diagnosis of leprosy with high sensitivity and specificity compared to conventional histopathology based methods. A multiplex (m)-LAMP assay for differential diagnosis of Leprosy and PKDL that are co-endemic diseases with similar clinical presentation was also developed.
- Four Novel “Signature Sequences” have been used in PCR based method to detect Mycobacterium tuberculosis in TB patients with significantly higher sensitivity and specificity,
- Patents for the use of Signature Sequence in TB detection has been filed in India and Europe. (Application No. IN201617018756 & EP 3382040 A2)
- In collaboration with IIT-Delhi, a cost-effective, portable, field–deployable and ease-of use “seeTB” device that can enhance the optical efficacy of normal microscope to detect Mycobacterium tuberculosis in clinical samples has been developed. This device will be validated at Model Rural Health Research Unit (MRHRU)
- A novel TB sample liquefaction and processing media has been filed in India (Application No. 201811044208)

- Mycobacterium tuberculosis "Signature Peptides" (Indian Patent application No. 202011011525 & 202011007810) that can be used in TB vaccine are being used to develop recombinant-BCG vaccine with improved protection efficacy for both adults and children population.
- We have repurposed FDA approved drugs that can be used as adjunct with anti-TB drugs and which has potential to reduce dosage of TB drugs.
- Patents for the role of these repurposed drugs as medicament against biofilm-associated infections have been filed/accepted in India and International countries. (Application Nos. WO 2018/193477 AI, US20200188477 AI, SA/2019/07396, SG11201909818S, AP/P/2019/011992)
- A New Chemical entity "DRILS 1398" (Application No. PCT/IB2019/ 056972) was developed that can target latent TB mechanism pathway utilized by Mycobacterium tuberculosis. Pre-clinical drug-discovery studies are underway**.**

ICMR - Rajendra Memorial Research Institute of Medical Sciences, Patna

- Trend analysis of secondary data revealed that projected incidence of Kala-azar cases will be under control subject to continuation of the existing intervention tools of elimination program.
- ADA and IL10 was found as possible biomarker for asymptomatic to disease conversion.
- A study revealed inadequate diagnosis and treatment at periphery level, only 10% of Govt. health facilities had slit-skin examination facility (only at district hospital level).
- Three course of Amphotericin B at 0.5mg/kg regimen (20 infusions daily) is equally efficacious to 1mg/kg regimen (20 infusions on alternate day).
- Single dose AmBisome (10 mg/kg b.w.) treatment in children Kala-azar cases (5-15 years) was found safe and highly effective with 98% final cure rate.
- In PKDL treatment, miltefosine and paromomycincombination showed final cure rate of 83% at 12 months follow up.
- Miltefosine (12-weeks) has better efficacy (cure rate 86.9%) with lesser side effects than 30 mg/kg (total dose over 3 weeks) of AmBisome (cure rate 78.7%) in PKDL treatment.
- AmBisome® (30 mg) plus miltefosine for 14 days has better cure rate than 40 mg of AmBisome® alone with less side effects for treatment of VL in HIV-VL co-infection,
- Significant contribution in vector control under IRS program includes: Reporting of DDT-resistance in sandflies and role of GST protein in resistance development, replacement of DDT with alphacypermethin, stirrup pump with compression pump.
- Further, combination of IRS+ITN was found more effective as compared to IRS or ITN alone.
- Clerodolone, isolated from 9th Fraction of Methanol phase of hexane extract of leaves, was identified as an active compoundhaving insecticidal effect to *P. argentipes*.
- Vector density is not directly related to Kala-azar endemicity level. The observed change in vector habitat (endophilic to exophilic) might be as impact of regular IRS.
- The previously developed "Vaishali model" for Kala-azar elimination was replicated in Saran and Siwan (highly endemic districts of Bihar) as per directives of Directorate of NVBDCP in collaboraton with the State Health Dept.
- Vitamin D concentration is much reduced in asymptomatic VL cases and may contribute in development of full blown disease.
- *L. donovani Mevalonate* Kinase (Ld MVK) has been studied as a probable VL diagnostic marker.

- TNF-α is associated with Integrin mediated defect in neutrophils trafficking in macular PKDL that might be a reason for difficult to treat.
- Two key scaffold proteins: Nbp35 and Cfd1 of iron-sulfur (Fe-S) clusters assembly and its interaction plays a role in leishmania physiology.
- Enoyl-(acyl carrier protein)-reductase as an effective drug target in *L. donovani* and β-d-glucan as a potential adjunct therapy with Amphotericin B without drug-drug interaction.
- MHC Class I and II epitope could render a strong synergistic effect of Th1, Th17 and TC17 cells that can control the disease pathogenesis.
- Animal studies revealed Gene from Ornithine decarboxylase (ODC) of *L.donovani* as a potential DNA vaccine candidated. Dendritic cell primed vaccination with recombinant cytosolic tryparedoxin (cTXN) led to high level of IFN-γ and low level of IL-10.
- Anti-saliva antibodies (SP15 family proteins) of *P. argentipes*canbe explored as vector-based vaccine candidate for VL.
- TrypInDB, a user-friendly online resource of small molecule inhibitors having a varying degree of activity towards *Trypanosoma* sp., was developed and integrated with LeishInDB (http://trypindb.biomedinformri.com).
- Scrub Typhus and Leptospira was detected first time as causing agent of acute encephalitis syndrome (AES) in Bihar.
- Genome wide T and B cell epitope mapping of chikungunya virus by molecular docking revealed three epitopes ALFAKTHNL, ATVPFLLSL, and TLYPERSTL having higher anitgenicity based on higher binding energy than the reference epitopes.
- Diagnostic and epidemiological research support during AES/ JE outbreak in Bihar.
- One of the study partners for nation-wide Tuberculosis Prevalence study led by ICMR-NIRT, Chennai.
- The first-ever centre for RT-PCR testing in Bihar during COVID-19 pandemic, more than 8.3 lakhs samples tested till date. RT-PCR training was imparted to other Instituions.
- Sero-surveillance of COVID-19 in Bihar.
- One of the centres for Phase 2/3 COVISHIELD Vaccine trial (Safety cohort).

ICMR-National Institute of Cholera & Enteric Diseases, Kolkata

- ICMR-NICED initiated the creation of a National Antimicrobial Resistance Hub which was inaugurated by Hon`ble US Ambassador Mr. Kenneth. I. Juster in presence of Prof (Dr) Balram Bhargava, Secretary DHR & DG ICMR, Dr. Shanta Dutta, Director, ICMR-NICED, representatives from WHO and Govt of West Bengal on 16th Sept 2019. As a part of the above-mentioned endeavor, a National Repository of Antimicrobial Resistant Bacteria was also set up for storage of resistant isolates from five ICMR nodal centers across India.
- WHO prequalification was obtained for cholera and HIV labs for verification of performance abilities of in vitro diagnostic kits of cholera and HIV/AIDS. ICMR-NICED also continues to function as Regional Institute (East) of NACO since 2008.
- NABL accreditation of laboratories of bacteriology, virology, parasitology and VRDL continuing for second consecutive years since June 2018.
- CDSCO recognized laboratory for kit evaluation since Aug. 2018.
- WHO Collaborating centre for research and training on diarrhoeal diseases since January 2021.

- A study on transmission dynamics and other epidemiological and environmental determinants of typhoid and paratyphoid was undertaken by this institute (Apr. 2019 to Nov. 2020).
- A major study entitled "Immunogenicity and Safety of Rotavac and Rotasiil Administered in an Interchangeable Dosing Schedule among Healthy Indian Infants through an open labelled multi centric trial" was coordinated by ICMR-NICED. This study was of immense public health implications as this would ensure the scaling up the rotavirus vaccination in the country (2018-2020).
- Another major project titled "National Surveillance for enteric fever in India (Tier 1)" was initiated across India, where ICMR-NICED was a part (2017-2020).
- The 5th India International Science Festival (IISF) was held at Kolkata during 5-8 November 2019, where over 12,000 school and college students from across the country were attended. ICMR-NICED was a major partner and organized outreach programs at ICMR-NICED in the community for developing awareness about science and technology among common people and to impart knowledge on the role of technology, engineering and mathematics in the day to day activities of our lives.

ICMR-National Institute for Research in Tribal Health, Jabalpur

- Under "Intensified Tuberculosis Control Project among Saharia" project in 7 districts of MP, the institute has been successful in bringing down the tuberculosis prevalence to 1357 per 100000 Saharia tribe in 2019 in line with Prime Minister's vision for End-TB by 2025.
- In a public private partnership project "Malaria Elimination Demonstration Project (MEDP)", more than 90% reduction in malaria positivity was achieved in Mandla district within 36 months of operations. Seven research articles under this model has been published in various peer reviewed journal.
- Plasmodium vivax malaria has been identified in Duffy negative individuals from Southwestern Nigeria in Indo-African collaboration project.
- Monitoring of therapeutic efficacy of antimalarial drug showed that current regime of ACT for treatment of P. falciparum is efficacious in MP, Maharashtra, Chhattisgarh and Odisha.
- Validated the presence of deletion in Pf-hrp2/3 gene which is affecting the performance of hrp2 based RDT for diagnosis of *P. falciparum* malaria.
- Validated a point of care device (GazelleTM) for screening of malaria and sickle cell disease
- Sickle Cell Anemia Control and Treatment in Madhya Pradesh has been initiated for screening of 50 Lakh population in 22 tribal districts in different target groups.
- Micro mapping of G6PD deficiency has been done in two states and novel and rare variants were identified in tribes of Rayagada district Orissa and Dindori District, MP
- More than 1500 newborn have been screened for sickle cell anemia in tribal areas under the project focusing on New born screening and follow-up.
- ICMR-NIRTH findings and its strategy for fluoride control has been adopted by the program for mitigation of fluorosis problem particularly in rural areas.
- Under the India hypertension management initiative, more than 1.0 lakh hypertension patient from five districts of MP have been registered and being monitoring.
- Comprehensive health assessment of villagers of Tamnar block, Raigarh, Chhattisgarh was performed. Non-communicable diseases accounted for 53.9% of the deaths.
- The institute is working 24X7 and providing services for COVID-19 diagnosis and performed nearly 1.0 lakh tests in last 1 year. Apart from this it continues to provide diagnosis of 20 viruses of public health importance.
- Full genome sequencing of Hepatitis B Virus revealed several clinically and epidemiologically important mutations. The virus belonging to genotype D with sub-genotype D1, D2, D3 and D5 were detected.

- Research on socio-cultural aspects translating to health in tribes is undergoing and the institute has been successful in connecting with more than 100 tribal traditional healers. Further an implementation research project on Universal Health Coverage (UHC) has been initiated in 40 Saharia villages of Sheopur district, MP
- Successful functionalization of Central Animal Facility by achieving controlled environmental parameters. The facility also received permission for breeding of small animals from CPCSEA.
- The institute has successfully run the capacity building programs for training manpower from various medical colleges, district hospitals for RT-PCR based COVID-19 Diagnosis, sickle cell diagnosis and malaria microscopy.
- WHO has identified our institute as a Collaborating Center for the Health of the Indigenous Populations for the four years 2020-2024.
- ICMR-NIRTH has been awarded ISO 9001:2015 certification for 'Research in Tribal Health' on 27.05.2019 for a period of three years.
- The TIE TB project has been awarded BMJ South Asia award in year 2018-19.
- In past three years, institute has published 108 research articles, with an average impact factor of 5.15 during the year 2019-20.
- ICMR-NIRTH has actively participated in all 3 rounds of the ICMR's National COVID Sero-surveys for estimating the exposure to SARS-Cov-2 in general community and the containment areas.

ICMR- National Institute of Occupational Health, Ahmedabad

- ICMR-NIOH has established through its field study that Serum CC-16 (a lung protein) could be used as a screening tool for early detection of silicosis among silica dust exposed workers. Silicosis is considered as the most prevalent & disabling occupational disease with high morbidity & mortality among unorganized sector workers. Silicosis is also responsible for country's TB burden (silico-tuberculosis) substantially. Periodic screening of workers with serum CC-16 may detect silicosis early and may be initiated to reduce the dual morbidity of silicosis & silico-tuberculosis in India.
- ICMR-NIOH has developed a transdermal patch for detection of high lead level from sweat among lead industry workers.
- ICMR-NIOH has Developed an ELISA based indigenous Kit for detection of serum CC-16 in collaboration with ICMR-NIV (Mumbai Unit).
- ICMR-NIOH has Developed a training module in association with Public Health Foundation of India, Delhi, on Basic Occupational Health & Safety involving WHO, ILO & other national occupational health experts of India.
- ICMR-NIOH has conducted its first training on Basic Occupational Health & Safety among primary health care physicians on March 2020 in which Gujarat, Maharashtra & MP participated. This is an ongoing program to cover all the states of the country to improve the state capacity of occupational health & safety at primary care level.
- In response to pandemic due to Covid-19, ICMR-NIOH has established a laboratory on urgent basis for testing COVID-19 to support Govt. of Gujarat.
- ICMR-NIOH has been identified as Depot holder for distribution of Covid-19 test Kits for entire state of Gujarat.
- ICMR-NIOH had also participated in Rapid Antibody Kit evaluation of Covid-19 infection in Ahmedabad city as a part of nation-wide kit evaluation coordinated by Indian Council of Medical Research, New Delhi.

- ICMR-NIOH is in the process of validating a face mask/face shield developed by CSIR which is biodegradable & reusable. Considering the fact that the existing disposal of huge load of discarded face mask particularly during corona crisis is not eco-friendly in many areas.
- ICMR-NIOH in association with state of Gujarat is preparing for conducting a community-based survey to assess the extent & magnitude of Covid-19 transmission in various districts of Gujarat.
- Based on achievements, NIOH has filed 4 patent applications during 2020 through ICMR patent cells.

ICMR-National Institute of Malaria Research, Delhi

- MERA India: In order to identify, articulate, prioritize and respond to the research needs of the country for malaria elimination, an alliance has been formed to bring together the research institutes (both ICMR and non-ICMR), national programme and other stakeholders. The alliance was launched on World Malaria Day. A call for proposals has also been given based on priorities identified during thematic working group meetings.
- NIMR initiated studies on surveillance of Zika virus in Aedes mosquitoes. Zika virus was demonstrated in Aedesaegypti collected during outbreak in Jaipur ,thus proving its transmission in India.
- The WHO CC for insecticide testing has been upgraded and applied for GLP certification.
- Experimental huts are being established in Gujarat for Phase II evaluation of LLINs and IRS.
- Indigenous cost effective, reusable, efficient and acceptable ovitraps were tested in laboratory as well as in field conditions.
- Health Impact assessment studies at 20 dam sites of Narmada river is being carried out. Mitigation measures suggested and due to proper interventions taken by NVDA and other stakeholders, no outbreak of malaria or other mosquito borne diseases was reported at any of the dam sites
- Reported DDT resistance in An. fluviatilis for the first time in Jharkhand.
- Bio-ecological studies on Aedesaegypti population were carried out in Tamil Nadu.
- NIMR in collaboration with other ICMR institutes carried out ICMR funded multi-centric study and generated data on vector ecology and insecticide resistance.
- PCR-based assays were developed to identify S989P and V1016G knockdown resistance (kdr) mutations in Aedesaegypti responsible for pyrethroid resistance
- A new kdr mutation, F1534L, in the voltage gated sodium channel of the Aedesaegypti showed significant protection against permethrin, deltamethrin and DDT. This mutation is being reported for the first time in Ae aegypti.
- Efforts for malaria elimination in Punjab: In order to demonstrate elimination of malaria in Category I assessment of burden of malaria in different parts of Punjab was carried out before venturing elimination of malaria.
- Mapping of malaria risk: Risk map of malaria using climatic, environmental, geographic and malaria endemicity has been developed which will help in planning intervention judiciously.
- Climate Change and Vector Borne Diseases: Under the aegis of DST-ICMR Centre of Excellence for Climate Change and Vector Borne Diseases, a bioclimatic model for identifying the endemic and non-endemic areas for Kyasanur Forest Disease in Southern India.
- Improving malaria diagnosis: New ELISA and RDT based diagnostic for detection of Glutamate Dehydrogenase was developed. NIMR is running Quality Assurance programme for Malaria RDTs used in the national programme. The institute also has WHO recognized malaria RDT lot testing centre. The institute organized various refresher courses on malaria microscopy to build the capacity in the country.
- Improving antimalarial treatment: NIMR carried out therapeutic efficacy studies at sentinel sites to guide the policies. Based on the clinical trials carried out by NIMR, the antimalarial combinations DihydroartemisininPiperaquine was registered in India.
- Studies to identify targets for antimalarial medicines / vaccines: Various proteases including cysteine/aspartic proteases have been validated as important drug targets.
- Identified stage-specific novel conformational epitopes from specific proteins of malaria parasite using in-silico approach for epitope identification and validation using the protein microarray. Selected

functional epitopes can be explored as a multistage diagnostic kit and these epitopes may be fused as vaccine candidates to elicit optimum immune responses.

- A study is focused to identify the crucial inhibitors which can specifically halt the processing of these falcipains and it has been found that series of non-coded amino acid based inhibitors block the processing of cysteine proteases by inhibiting salt and hydrophobic interactions of the pro and the mature domain.

ICMR-National Institute of Medical Statistics, Delhi

- A National Data Quality Forum (NDQF) has been established
- A project has been initiated to develop a tailor made data set points for registering Ayurveda studies using CTRI platform.
- Projects addressing health issues in tribal populations
- Evidence based health research
- HIV estimation 2019 round- state and district level estimates.
- India HIV Estimation 2017 and 2020 Technical Report were released. This report is available on the NACO website.
- India: National and sub national estimates of the disease burden and risk factors for major states was determined using alternative methods.
- The Clinical Trial Registry of India has approx. 22000 clinical studies registered till date.
- CTRI has developed and implemented ICD-10 coding for health condition capture uniform data for better data analysis.

ICMR-National Institute of Nutrition, Hyderabad

- Released The National Cancer Registry Programme Report 2020: The report estimates that in 2020 cancer cases in the country will be at 13.9 lakhs and likely to increase to 15.7 lakhs by 2025, based on current trends.
- Released Nutrient Requirements for Indians & What India Eats: The Nutrient Requirements for Indians, the revised Recommended Dietary Allowances (RDAs), for the first time includes the Estimated Average Requirements (EAR) and also the Tolerable Upper Limits (TUL) of nutrients alongside RDAs.
- "What India Eats" reports the dietary patterns across the country for the first time the data has been analysed and projected based on food groups. This report gives details of 'Regional Dietary Pattern of Indian Population' and energy and protein sources from different food groups in graphical form.
- Mapping of nutrition and health status – A national level participatory real-time data generation programme has been launched.
- Established Nutrition Surveillance System (NSS) in 6 states through the AWC of the ICDS.
- Awareness, knowledge and acceptance of Mid-day Meal (MDM) were studied among the beneficiaries (over 3 lakh children) and other stakeholders in 21 states.
- Vitamin B12 deficiency was associated with anaemia among vulnerable populations in a study conducted in eight states (Telangana, Madhya Pradesh, Odisha, Meghalaya, Tamil Nadu, Gujarat, Assam, West Bengal and Rajasthan).
- Low GI, multiple whole grain product was developed at NIN by combining millets, grains and soy. This formulation was tested for acceptability in the form of Roti and was found to be high in fiber and protein.

- Iron bioavailability studies on indigenously developed triple fortified rice (iron, folic acid, Vitamin B12) showed good retention of iron (>95%) during rinsing with water or with different cooking methods, while folic acid and vitamin B12 levels were reduced by ~25%.
- A study that investigated the role of ubiquitin-proteasome system (UPS) and ER stress in the brain of diabetic rats
- To date, there has been no non-invasive drug delivery system reported for the treatment of Diabetic Retinopathy. NIN developed a core-shell nanoparticle-based delivery system loaded with triamcinolone acetonide and evaluated its efficacy in a DR rat model.
- Among 400 milk products analyzed for the presence of S. aureus, contamination was found to be highest in Khoa (66%) compared to other milk products.
- Studies on fresh/packaged tender coconut water collected from three Southern States of India has provided the information on extent of chemical contamination to FSSAI in order to facilitate them to look into the requirement for fixing the limits in order to evolve cut-off limits of our own in the Indian context.
- A cross-sectional study conducted among primary home food preparers (N=400) in rural and urban (@200 each) areas of Telangana helped develop and validate a household food safety index (HFSI).
- A study assessed quality and effectiveness of popular calorie counting apps.
- Developed a ready-reckoner chart to inform the newly married couples and their family members on pre-conception nutrition and first 1000 days of life covering nutrition and health related aspects.
- NIN has developed a communication kit called "My Plate for the day to prevent hidden hunger" which has a simple visual representation of various food groups to be consumed in a day by an individual intending to reach a 2000 kcal diet.

ICMR-Vector Control Research Centre, Puducherry

- An alternate triple drug regimen (Ivermectin, Diethylcarbamazine and Albendazole- IDA) for the Mass Drug Administration (MDA)
- Development of Monitoring and Evaluation protocol for accelerated MDA with IDA for lymphatic filariasis elimination programme
- Mathematical modelling :ICMR-VCRC, as a partner of the Neglected Tropical Diseases Modelling Consortium (NTD-SC), is involved in developing and optimizing surveillance strategies [evaluation unit (EU) size, target population: human or mosquito; indicators (microfilaraemia, antigen, antibody)] for monitoring and evaluation of LF elimination programme.
- Studies on Wolbachia-based vector control strategy for control of dengue/ chikungunya transmitted by Aedesaegypti
- Vector surveillance for ZIKA in selected high risk areas in India
- Assessment of development of insecticide resistance in malaria vectors based on the exposure of different insecticides in ten southern districts of Odisha State
- Residual efficacy of DDT was determined in the field before and after spraying by cone bioassays indoors in ten malaria endemic districts of Odisha.
- Monocytes mediated MMPs expression was found to significantly participate in the development of dengue pathogenesis in the severe cases of disease and paracetamol has a protective effect in dengue viral disease.

ICMR-National Animal Resource Facility for Biomedical Research (NARFBR), Hyderabad

- This is an upcoming institute. Construction of the buildings is ongoing in full swing; Separate buildings and departments are under construction in the Institute campus for separate activities. Inauguration of complex planned in 2021

Regional Medical Research Centre, Bhubaneswar

- NABL accredited National Reference Laboratory for Tuberculosis catering services to 10 states including 7 from north east
- A phase-III, Randomized, Double-blind Placebo controlled trial to evaluate the efficacy and safety of VPM1002 and Immunovac (MIP/Mw) Vaccines in preventing Tuberculosis (TB) in Healthy Household Contacts of Newly Diagnosed Sputum positive pulmonary TB patients
- National Tuberculosis prevalence survey to estimate the burden.
- Successfully demonstrated role of Nutrition in improving Tb in tribal Odisha
- Periodic Evaluation of DAMaN to inform the effectiveness of malaria elimination strategies of in the state Odisha
- One Health strategy for elimination of human Anthrax from an endemic district of Odisha
- Study of Japanese Encephalitis Virus (JEV) Infection Associated Acute Encephalitis in Malkangiri District: Pre and Post Vaccination period
- Vectors surveillance (ZIKA, JE, Malaria), insecticide evaluation, malaria mapping in the state
- WHO accreditation for Laboratory surveillance of Measles & Rubella
- Developed the Human Anthrax diagnosis facility in the Centre which will cater service to the state and will be 1st in the state.
- Set up of Model Rural Health Unit (MRHU) at Tigiria, Cuttack
- Improving the Health Care Access and Quality in the Context of Achieving Universal Health Coverage (UHC) among Scheduled Tribes: An Implementation Research a National Task Force project at Nabarangpur.
- Successfully completed the Diagnostic validation and Health Technology of SOHUM, hearing impairment screening device under project entitled "Diagnostic Validation and Health Technology Assessment of 'Portable Automated ABR' Neonatal Hearing Screening Device"
- Virology Research & Diagnostic Laboratory upgraded to Regional Laboratory to support health system in viral diagnosis and outbreak investigation
- Improving the Capacity of Health and community for sickle cell Diseases screening and management: an intervention study in Kalahandi District Odisha
- Health profiling of particularly Vulnerable Tribal Group in Odisha, funded by state Tribal affairs department.
- Developed the 1st policy brief on Anthrax control in India, "Roadmap for Anthrax prevention in Odisha (https://www.icmr.nic.in/content/policy-brief).
- Identified the etiological agent causing AGE outbreak in Cyclone relief shelter in Odisha post extremely severe cyclone Fani.
- Documented the bacterial etiology causing diarrhoeal disease in under 5 years.
- Scientist from the centre was member of the central team deputed by Emergency Medical Relief of DGHS, Govt. of India, to investigate and contain the Avian Influenza outbreak in Krushnaprasad block of Puri district during 14-23rd December, 2018 and developed the micro plan for containment and

effective management of the outbreak and submitted to district and state health officials for necessary action.

- Scientists from the centre a member of the central team deputed by Emergency Medical Relief of DGHS, Govt. of India to assess the situation and post disaster management in Puri district post the Extremely Severe Cyclone, Fani hit the district on 3rd May, 2019.
- Short term assessments to inform accelerated distribution, uptake, and promotion of increased use of Liquefied Petroleum Gas (LPG) through Pradhan MantriUjjwalaYojna (PMUY)
- Study of Mid-Day-Meal Programme in Odisha: Impact Evaluation
- Strengthening of ICDS-MIS cell in Women and child Development & Mission Shakti Department Odisha.
- Smart city environmental health profiling
- Study on Smokeless Tobacco and Reproductive Health in Urban slums
- Institute has started academic programmes for Master in Public Health (MPH) and PhD Public Health initiated under Utkal University as a nodal centre. Second batch of MPH programme has been initiated.