CNCI

ANNUAL REPORT

वार्षिक प्रतिवेदन

2020-21

CHITTARANJAN NATIONAL CANCER INSTITUTE

Kolkata

चित्तरंजन राष्ट्रीय कैंसर संस्थान

कोलकाता

Table of Contents

Governing Body

Chittaranjan National Cancer Institute, Kolkata

1.	Chairman	Union Minister of Health & Family Welfare
2.	Alternate Chairman	Minister of Health & Family Welfare, Govt. of West Bengal
3.	Member	Secretary, Ministry of Health & Family Welfare, Govt. of India or his Nominee
4.	Member	Director General of Health Services, Directorate General of Health Services, Govt. of India, New Delhi
5.	Member	Financial Adviser, Ministry of Health & Family Welfare, Govt. of India, New Delhi
6.	Member	Secretary, Department of Health & Family Welfare, Govt. of West Bengal, Kolkata
7.	Member	Secretary, Finance Department, Govt. of West Bengal, Kolkata
8.	Member	Director of Health Services, Govt. of West Bengal, Kolkata
9.	Member	Director General or his Nominee, Indian Council of Medical Research, New Delhi
10.	Member	Director or his Nominee, Post Graduate Institute of Medical Education & Research, Chandigarh
11.	Member	Director or his Nominee, Institute of Post Graduate Medical Education & Research, Kolkata
12.	Member	Director, Saha Institute of Nuclear Physics, Kolkata
13.	Member	Director, School of Tropical Medicine, Kolkata
14.	Member	Nominee of the Department of Atomic Energy
15.	Member	Director, All India Institute of Hygiene & Public Health, Kolkata

Amendment

16.	Member	Vice-Chancellor, West Bengal University of Health Services (11th Meeting of the Governing Body, held on 26.04.2005)
17.	Special Invitee	Vice-Chancellor, University of Calcutta, (12th Meeting of the Governing Body, held on 21.08.2010)
18.	Member	Chairman, Standing Finance Committee (10th Meeting of the Governing Body, held on 02.08.2003)
19.	Member	Two Experts in Biological Sciences related to Oncology - one to be nominated by the Union Health Minister and the other by the State Health Minister
20.		
21.	Member	Two Faculty Members of Chittaranjan National Cancer Institute
22.		
23.	Member	By rotation to be nominated by the Standing Academic Committee
24.	Member	Director, Chittaranjan National Cancer Institute

Chittaranjan National Cancer Institute

DIRECTOR
Dr. Jayanta Chakrabarti

RESEARCH WING
O.I.C.(R)

HOSPITAL WING
M.S. & A.M.O.

Ruplal Nandy Memorial Cancer Research Centre, Chandannagar

Scientific Departments

1. Anticancer Drug Development
   In-Charge: Dr. M Roy
2. Cancer Chemoprevention
   HoD: Dr. P. Saha
3. Environmental Carcinogenesis & Toxicology
   HoD: Dr. M Roy
4. Epidemiology & Biostatistics
   HoD: Dr. S S Mandal
5. Immuoregulation & Immunodiagnostics
   HoD: Dr. R Baral
6. In Vitro Carcinogenesis & Cellular Chemotherapy
   In-Charge: Dr. M Roy
7. Neuroendocrinology Experimental Hematology
   In-Charge: Dr. M Roy
8. Oncogene Regulation
   HoD: Dr. J Chakrabarti
9. Pathology & Cancer Screening
   HoD: Dr. P Nath
10. Receptor Biology & Tumor Metastasis
    HoD: Dr. D Sinha
11. Signal Transduction & Biogenic Amines
    HoD: Dr. N Murmu
12. Clinical & Translational Research
    HoD: Dr. K K Mukherjee

Ancillary Depts./ Units/Sections

1. Central Research Instrumentation Facility
   In-Charge: Dr. M Roy
2. Academic Cell
   Academic Coordinator: Dr. S Mukherjee
3. Animal Care & Maintenance
   HoD: Dr. A Rakshit
4. Library
   ALIO: Mr. S Chakraborty & Mr. G Gorai
5. Computer Section
   In-Charge: Mr. K S Roychowdhury
6. Maintenance Department
   In-Charge: Dr. A Rakshit

Major Departments

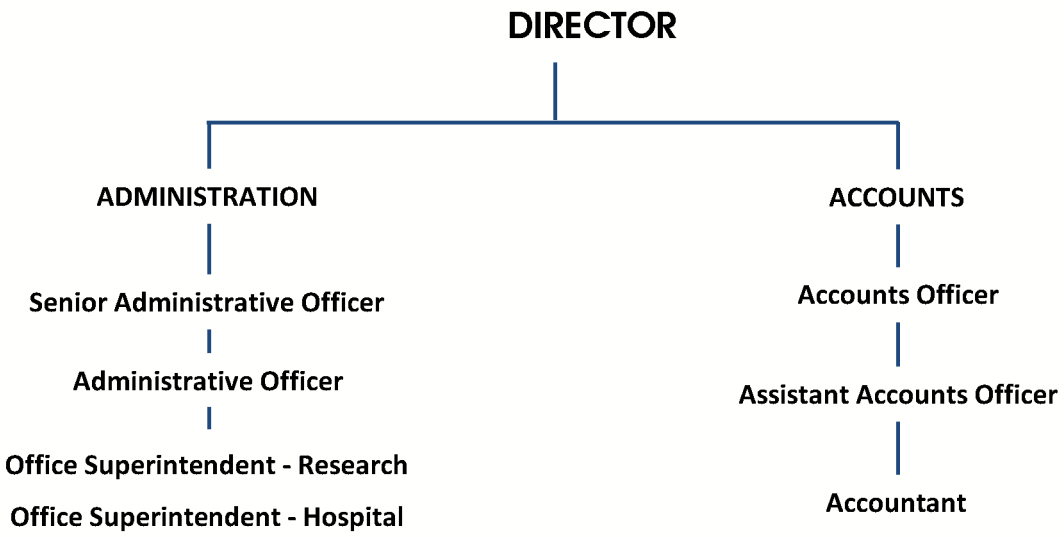
1. Anesthesiology
   HoD: Dr. S Ray
2. ENT-Head & Neck Oncology
   HoD: Dr. A Dam
3. Gynecological Oncology
   HoD: R K Mandal
4. Medical Oncology
   HoD: Dr. K K Mukherjee
5. Paediatric Oncology Section
   Section In-Charge: Dr. K K Mukherjee
6. Medical Physics
   HoD: Dr. D K Ray
7. Pathology
   HoD: Dr. S Hajra
8. Radiation Oncology
   HoD: Dr. T Maji
9. Radiodiagnosis
   HoD: Dr. S Mazumder
10. Surgical Oncology
    HoD: Dr. J Chakrabarti
11. Division of Preventive Oncology
    HoD: R K Mandal

Ancillary Depts./ Units/Sections

1. Pain & Palliative Care Unit
   HoD: Dr. R K Mandal
2. Medical Records
   HoD: Mr. S Chakraborty
3. Dental Surgery
   Consultant: Dr. A Khandelwal
4. Dietetics
   Dietitian: Ms. P Das Dutta
5. Nursing Services
   Asst. Nursing Supdt: Ms. M Barui (Mukherjee)
6. Rehabilitation Services

Chittaranjan National Cancer Institute

Administrative Set-up



FROM THE DESK OF DIRECTOR, CNCI

I am privileged to share my views with you for the Annual Report of the institute for the Year 2020-2021. The year 2020-2021 for CNCI, Kolkata was significant with development and milestones. It was in this time CNCI 2nd Campus was soft launched with OPD and Day-care chemo services in spite of nationwide Covid wave. All the academic courses like DNB, DRDT, DRTT and PGD in Medical Physics were successfully running in CNCI 1st Campus and at the same time a large number of faculty members of the institute's research division were partnering and collaborating with various prominent institutes and research organisations like DBT and ICMR. On the other hand CNCI 2nd Campus were preparing its modern laboratory facility which has already received prestigious NABL Entry level Certification.

I congratulate all the deserving staff and their family for the sacrifice they are making for new-age CNCI. I am sure that in this process of making they will be not only be benefitted but they will be proud of the organisation they are working with.

The Institute has carried out a number of Construction Works and major repair and renovation works in CNCI 1st Campus ,while the 2nd campus is ready to embrace a group of new doctors, nurses and most importantly patients in its completed magnanimous facility at Newtown,Kolkata.

Looking forward, I wish to scale higher targets in the healthcare sector which is evolving rapidly. The bigger picture is to make healthcare more accessible and affordable to our populace particularly the vulnerable section, in an efficient and equitable manner . The vision can be achieved and sustained only by involving various stake holders.

Before I conclude I would like to thank the Ministry of Health & Family Welfare, Government of India and Department of health and family welfare, Government of West Bengal for fully supporting and backing the institute in its endeavour to reach greater heights. I thank our benefactors, research partners and faculty staff for their concerted efforts towards the growth of the Institute. I also wish to sincerely thank the COVID-19 warriors of the institute for the grit, determination and resilience shown by them.

Long Live CNCI ! Jai Hind !

FROM THE DESK OF MEDICAL SUPERINTENDENT, CNCI

Chittaranjan National Cancer Institute being an apex clinical and research Institute in the field of Oncology and Oncosurgery; strives to develop service to the citizens of East and north-east of India in general. Since its inception as a premier Regional Cancer Centre for eastern India, it is committed to Cancer Prevention, Treatment and Research.

2020 has been a most unprecedented year. No one, anywhere in the world could have predicted the kind of havoc COVID-19 created, but new initiatives conceived a couple of years ago have been reality in CNCI with the soft-launch opening of its second campus at Rajarhat, Newtown with OPD and Day-Care facility.

While CNCI 1st Campus also has undergone major changes and improvement in the patient care and management facilities with extensive reorganization and renovation of all the departments, wards, laboratory and introduction of state of art Low energy Linear accelerator, the radiology and clinical laboratory are also shaping up as a reference diagnostic centre of international standard in the 2nd Campus along with installation of modern Brachytherapy unit.

In the Second campus, while the new OPD building is catering departments like Surgical Oncology, Radiation Oncology, Medical Oncology and Day-Care chemotherapy unit, in the near future GI surgery is going to start in its fully modular state of art Operation theatre complex having 8 OTs.

Today when we will be fully functional with our new campus in New Town, we are going to emerge as the leader of Onco-care with the largest no of beds in recent future i.e. 210 beds in Old Campus and 460 beds in second, exclusively dedicated to the vulnerable sections of East and North East with all recent advancement.

The basic ethos of CNCI will always be, to understand the nature of the malignant disease and provide better to best facilities for prevention and management of the disease and that will always remain its primary goal. The second campus believably will initiate a strong coverage of many cancer patients in this part of the country for whom Government hospitals are only solace.

However in the devastating Covid time, which challenged economic growth, industrial progress and overall life and morale of the population at large, we at CNCI 2nd Campus set forth a dedicated Covid RT PCR centre in collaboration with ICMR, which has basked the glory of performing more than 50 thousand tests till now.

There has been a renewed and sharpened focus on strengthening the overall cancer care system in CNCI and together we all now need to be vigilant and committed to achieve continued momentum in bringing laurels to the Institute in the future years.

Long Live CNCI

Dr Sankar Sengupta

Medical Superintendent, CNCI

HOSPITAL WING

Deptt. Of Anaesthesiology and ITU

Dr. Shubhra Ray Specialist Grade I (HOD)
Dr.Deepa Chakrabarti Specialist Grade II(SG)
Dr.Deepanwita Das Specialist GradeII
Dr.Debasish Jatua SMO
Dr. Shikhar More Contractual consultant
Dr.Sudipta Sengupta ITU RMO
Dr. Satavisha Das ITU RMO
Dr.Abir Banerjee ITU RMO
Dr. Ajoy Choudhury ITU RMO

Major surgeries under general ± regional anaesthesia

	Major		Emergency	In-operable/ Palliative	Total
Surgery Unit I	**GI & genitourinary**	77	08	04	**223**
	Head and neck	58			
	Breast and soft tissue	71			
	Laparoscopy	03			
	Others				
Surgery Unit II	**GI & genitourinary**	14	02		**133**
	Breast and soft tissue	83			
	Head and neck	34			
	Laparoscopy				
	Others				
Surgery Unit III	**GI & genitourinary**	37	04	02	**131**
	Breast and soft tissue	39			
	Head and neck	46			
	Laparoscopy	02			
	Thoracic				
Gynaecology	**129**		05	03	
	Laparoscopy	**02**			
ENT and head- neck					**85**
Radiology/Radiotherapy	01				
Total	**712**				

Types of Anesthesia

General Anesthesia	Subarachnoid Block	Epidural Anesthesia	General+Epidural Anesthesia	Combined spinal+Epidural Anesthesia	Local Anesthesia/Regional Block+Sedation
480	**82**	**26**	**95**	**24**	**05**

Difficult intubation done with flexible video bronchoscope - 31

Pre Anaesthetic Check up OPD (Wednesday and Friday)

Total no cases : 1815

New :947 Old : 868

Male : 804 Female : 1011

ITU

	No. of cases	No. of deaths
Surgery	478	05
ENT	82	1
Gynae	123	2
Medical Oncology	11	1
Radiotherapy	3	1

Total no. of cases 697

Total no. of deaths 10

NAME OF THE DEPARTMENT: ENT-Head & Neck Oncology

Departmental Photo

HEAD OF DEPARTMENT: Dr Aniruddha Dam, MS, DLO, DNB (Specialist-Grade I)

DEPARTMENTAL TEAM

Dr. Anup Kr. Bhowmick, MS	(Specialist Grade I)
Dr. Aniruddha Sarkar, M.S,DNB,MNAMS	(Specialist Grade II) (Till 08.02.2021)
Dr. Rup Kr. Saha, M.B.B.S, DIH,DHA	CMOH & OIC (H) (NFSG) from 01. 09.2020
Dr Ankit Khandelwal, BDS, MDS	(Contractual Dental and Maxillofacial Consultant)
Dr. Sukanya Naskar, M.S	(Sr. Resident)
Dr. Samyadipta Dey, M.S	(Sr. Resident)
Dr. Subhadra Murmu, MBBS	(Jr. Resident) (Till 31.10.2020)
Dr. Adrineel Banerjee, BDS,MDS	(Observer)
Dr. Monalisa Banerjee, BDS,MDS	(Observer) (From 07.11.2020)
Ms. Priti Singh	(Asst. Health Worker) (From 01.10.2020)
Mr ShibuNath Jana	(OPD GDA staff)

CLINICAL WORK DONE:

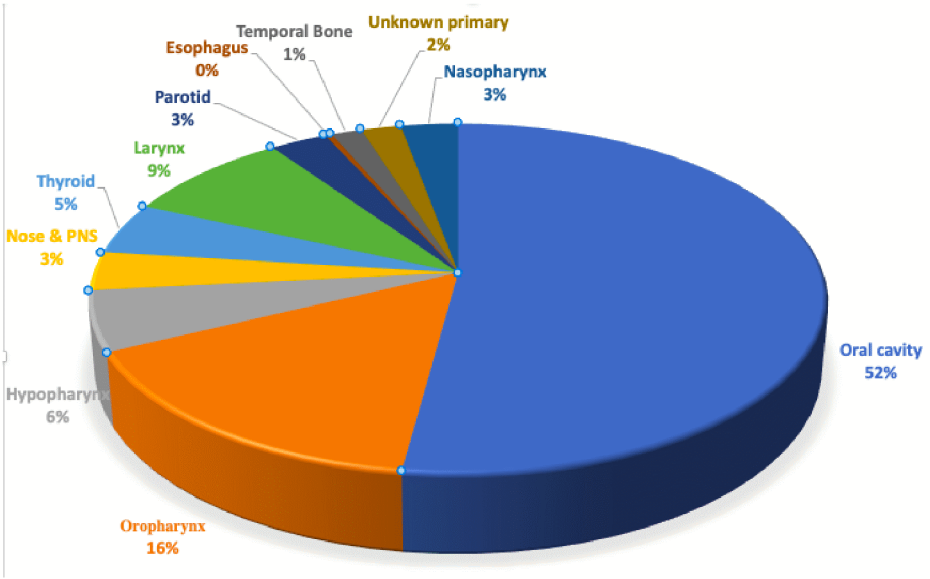


Fig 2: Anatomical Region Distribution of confirmed cases

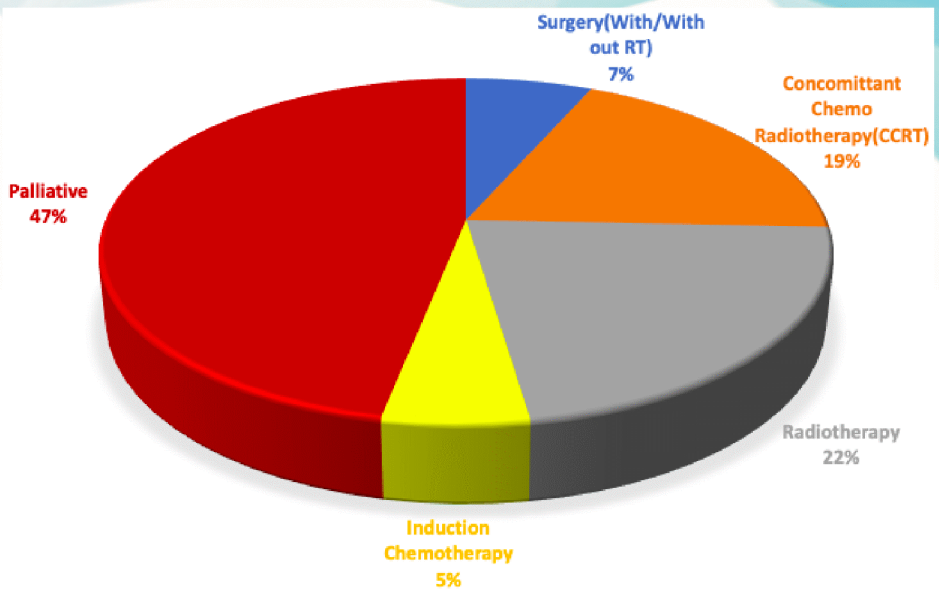


Fig 3: Treatment Modalities offered at Multi-Disciplinary Team Board during this period

(I) Analysis of patients reviewed by the department during this period:

CLINICAL WORKLOAD	TOTAL NUMBERS
Total number of cases (OLD+ NEW) reviewed by the department:	4753
Total number of NEW CASES attending the department:	1056
Total number of OLD CASES followed up in the department:	3697
Total number of patients attending TUMOR BOARD	848
Total number of Surgeries decided in Tumor Board	165
Total number of ADMISSION	81; 54(M) 27(F)
Total number of Planned MAJOR SURGICAL Procedures	91
Total number of MINOR SURGICAL Procedures	280
Total number of MORTALITY	9
Total number of Emergency TRACHEOSTOMIES	7

CLINICAL ACTIVITIES/OBJECTIVES OF THE DEPARTMENT:

During the above period, due to the spread of the Covid 19 pandemic and the sudden imposition of Lockdown measures by Government of India, routine patient care services in the ENT-Head & Neck Oncology Department was severely affected. The compulsory staggered distribution of CNCI Health Care Workers, the use of adequate PPE during patient examination and handling and the potential for viral spread during any aerosol generation procedure (e.g. tracheostomy. DL scopy and oral surgeries) greatly affected normal patient care services in the department. Significant modification of the treatment protocols had to be initiated so that care of the diagnosed case could be maintained with minimal hazard to other health care workers. Internationally accepted treatment protocols based on chemo-radiotherapy were also modified to cater to this special circumstance. As a consequence the initial months saw a great reduction in the major ablative and reconstructive surgeries done by the department. There was more than 41% reduction of patient attendance in the department including new patient registration, follow-up patients and patients attending the Tumor Board. The analysis of the surgical cases revealed more than 36% reduction on surgical output during this period but the average complication, mortality or recurrence were within acceptable parameters. The department continued to function every day during this period and MDT Boards were conducted each day to quickly decide on the patient's treatment modalities. Admission was restricted to negative RT-PCR patients and separation of positive and negative patients were maintained as per the Institute's SOP.

Fig. 4 & 5: Data comparing new and follow-up cases during 2019-21

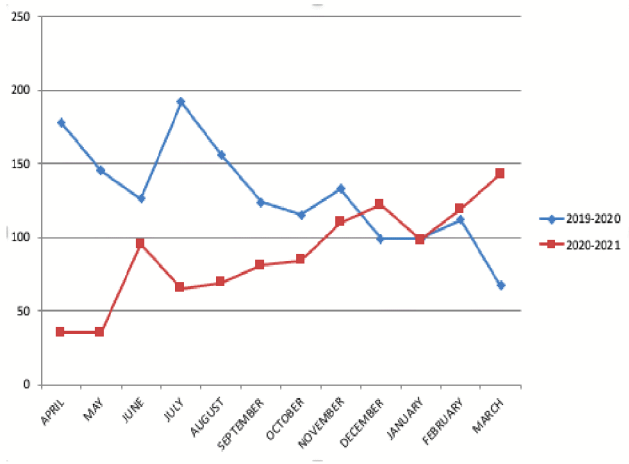


Fig 4: Comparison of New OPD cases

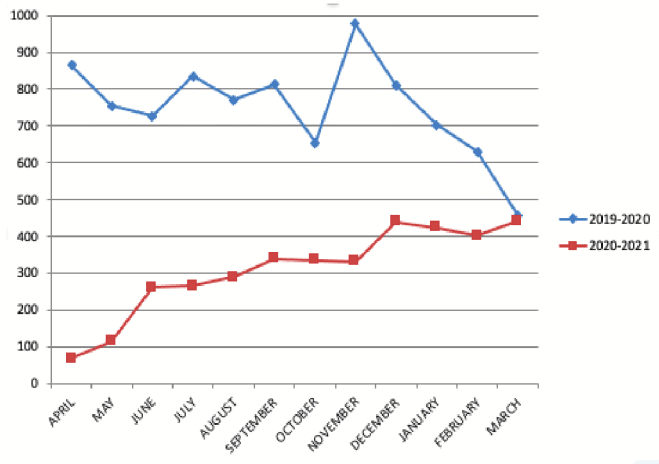


Fig.5: Comparison of Follow-up cases

Training & Teaching

1. **Nasopharyngeal Sample for RT-PCR:** Department was forefront in Collection of Sample for RT-PCR for patients attending the Institute as part of Covid 19 sampling SOP. Nasopharyngeal samples were collected for all indoor admitted patients by the departmental doctors six-days per week with cooperation of other staffs of the Institute.
2. **Covid Strategy Committee**: As Chairman of the Institute's Covid Strategy Committee, Dr Dam helped in implementing the different Institutional SOP as per ICMR & Government of India Guidelines.
3. **DNB& PhD:** Specialists conducted classes for **Ph.D. & DNB Students** of various disciplines (both Clinical & Research) in CNCI.
4. **Fellowship / Observership Program:** The department continued with the Honorary **Head & Neck Fellowship Program / Observership program** as part of its mandate for training of manpower in oncology.
5. Conducted intra-departmental **Journal Clubs** and **CME's** on topics such as **"Role of TORS in HPV positive early Oropharyngeal cancers"** and **"AJCC 8th vs 7th edition: new additions".**
6. **Officer–in-Charge (OIC (H):** Dr Rup Kumar Saha took on the additional administrative responsibilities of OIC (H) with effect from 01.09.2020

RESEARCH PROJECTS

1. **Continuation of the study:***"Evaluation of population prevalence and oncogenic potential of novel HPV type 217, 218, 223, and 22" with*: Dr. Sankhadeep Dutta and Dr. Chinmay Kumar Panda, CNCI Kolkata as Principal Investigators.

2. **New Study Project Title** *" Integrative multi-omics spatial characterization of oral field cancerization for better informed clinical decisions"* with Dr. Biswarup Basu, Dept of Neuroendocrinology, CNCI & Dr. Nidhan Kumar Biswas, Assistant Professor, NIBMG, Kalyani as Principal Investigator.

PUBLICATIONS:

1. A Study titled: *"A Retrospective Observational Study of the Clinical Output and Patient Care Services during Covid-19 Pandemic (April 2020 to September 2020)"* is awaiting publication submission**. This Retrospective Observational Study on COVID-19 Pandemic** is aimed to understand implication of the sudden lockdown during the Covid-19 Pandemic in the flow of clinical work output in the department of ENT-Head & Neck Oncology in CNCI to analyze the impact of the Covid-19 Pandemic on the clinical output during the first six months (April 2020 to September 2020)

Conference/Symposium/Workshop Attended:
Dr. Aniruddha Dam,

1) Participated as a delegate in the webinar (virtual meeting) *"Master Course in Oral Cancer Management 2020"* organized by the Tata Memorial Centre, Mumbai on 18-19th September 2020

2) Participated as a delegate in the webinar *"International Joint Seminar: Multidisciplinary Approach to Advanced Oral Cancer: Prevention to Palliation"* organized by: The American Head & Neck Society, The Foundation for Head & Neck Oncology (FHNO) and the Tata Memorial Centre, Mumbai on 5th February 2021

Dr. Anup Kr Bhowmick,

1) Attended an online CME – *Oral Cancer E-Conclave: "Intrigues of Oral Cancer"*, a 4-part academic series encompassing topics like Diagnosing an Oral lesion, Early and Locally advanced Oral Cancers, Rehabilitation and Follow up of Oral Cancer patients. Organized by FHNO from 04.04.21 to 18.04.21.

2) Attended the Surgical Oncology Workshop at the 19th*Annual Conference of Evidence based management of cancers in India*, held at Tata Memorial Center, Mumbai on 27th February 2021. The workshop encompassed topics of 3D Printing in Surgical Oncology, Robotic Surgery and Image Guided Surgery.

3) Participated as a Delegate in the *"Master Course in Oral Cancer Management 2020 – Surgical Nuances with Evidence Based Practise."* A Webinar organised by Tata Memorial Hospital, Mumbai on 18th and 19th September 2020

Dr. Rup Kr Saha,

1) Attended an online CME – *Oral Cancer E-Conclave: "Intrigues of Oral Cancer"*, a 4-part academic series encompassing topics like Diagnosing an Oral lesion, Early and Locally advanced Oral Cancers, Rehabilitation and Follow up of Oral Cancer patients. Organized by FHNO from 04.04.21 to 18.04.21.

2) Attended the Surgical Oncology Workshop at the 19th*Annual Conference of Evidence based management of cancers in India*, held at Tata Memorial Centre, Mumbai on 27th February 2021. The workshop encompassed topics of 3D Printing in Surgical Oncology, Robotic Surgery and Image Guided Surgery.

3) Participated as a Delegate in the *"Master Course in Oral Cancer Management 2020 – Surgical Nuances with Evidence Based Practise."* A Webinar organised by Tata Memorial Hospital, Mumbai on 18th and 19th September 2020

Dr. Ankit Khandelwal,

1) Presented a lecture on *Problem based learning in oral oncology* as a guest lecturer on 21st November 2020 at Ramachandra Maxillofacial Alumni webinar series 2020.

2) Attended an online CME – *Oral Cancer E-Conclave: "Intrigues of Oral Cancer"*, a 4-part academic series encompassing topics like Diagnosing an Oral lesion, Early and Locally advanced Oral Cancers, Rehabilitation and Follow up of Oral Cancer patients. Organized by FHNO from 04.04.21 to 18.04.21.

3) Attended the Surgical Oncology Workshop at the 19th*Annual Conference of Evidence based management of cancers in India*, held at Tata Memorial Centre, Mumbai on 27th February 2021. The workshop encompassed topics of 3D Printing in Surgical Oncology, Robotic Surgery and Image Guided Surgery.

4) Participated as a Delegate in the *"Master Course in Oral Cancer Management 2020 – Surgical Nuances with Evidence Based Practise."* A Webinar organised by Tata Memorial Hospital, Mumbai on 18th and 19th September 2020

Dr. Sukanya Naskar,

1) Participated in the webinar –"*TMC Postgraduate teaching program 2021*" organized by TMC-ACTREC on 24th and 25th April 2021.

2) Attended an online CME – *Oral Cancer E-Conclave: "Intrigues of Oral Cancer"*, a 4-part academic series encompassing topics like Diagnosing an Oral lesion, Early and Locally advanced Oral Cancers, Rehabilitation and Follow up of Oral Cancer patients. Organized by FHNO from 04.04.21 to 18.04.21.

3) Attended an online CME – *"Robotic Head Neck Surgery: Indications, Challenges and Advances"*, organized by NH Cancer Care on 28th February 2021

4) Attended the Surgical Oncology Workshop at the 19th*Annual Conference of Evidence based management of cancers in India*, held at Tata Memorial Center, Mumbai on 27th February 2021. The workshop encompassed topics of 3D Printing in Surgical Oncology, Robotic Surgery and Image Guided Surgery.

Dr. Samyadipta Dey,

1) Participated in the webinar –"*TMC Postgraduate teaching program 2021*" organized by TMC-ACTREC on 24th and 25th April 2021.
2) Attended an online CME – *Oral Cancer E-Conclave: "Intrigues of Oral Cancer"*, a 4-part academic series encompassing topics like Diagnosing an Oral lesion, Early and Locally advanced Oral Cancers, Rehabilitation and Follow up of Oral Cancer patients. Organized by FHNO from 04.04.21 to 18.04.21.
3) Attended an online CME – *"Robotic Head Neck Surgery: Indications, Challenges and Advances"*, organized by NH Cancer Care on 28th February 2021
4) Attended the Surgical Oncology Workshop at the 19th *Annual Conference of Evidence based management of cancers in India*, held at Tata Memorial Center Mumbai on 27th February 2021. The workshop encompassed topics of 3D Printing in Surgical Oncology, Robotic Surgery and Image Guided Surgery.
5) Completed an online *6-Module Certificate Course in Telemedicine Consultation/Practice Guidelines*, organized by American College of Digital Healthcare on 27th September 2020.
6) Participated as a Delegate in the *"Master Course in Oral Cancer Management 2020 – Surgical Nuances with Evidence Based Practise."* A Webinar organised by Tata Memorial Hospital, Mumbai on 18th and 19th September 2020

Dr. Adrineel Banerjee,

- Participated as a Delegate in the *"Master Course in Oral Cancer Management 2020 – Surgical Nuances with Evidence Based Practise."* A Webinar organised by Tata Memorial Hospital, Mumbai on 18th and 19th September 2020

Dr. Monalisa Banerjee,

1) Participated in the webinar –"*TMC Postgraduate teaching program 2021*" organized by TMC-ACTREC on 24th and 25th April 2021.

Department of Gynaecological Oncology

Team

Name	Designation
Specialists **Dr. Ranajit Kumar Mandal, MD, DNB, PGDHHM** **Dr Manisha Vernekar, MS, DNB** **Dr Dipanwita Banerjee, MS, DPM**	 **Head of the Department and Specialist (Grade I)** **Specialist (Grade II)** **Specialist (Grade II)**
Dr. Asima Mukhopadhyay, MD, DNB, DGO, MRCOG, PhD, MSc	**Honorary Consultant**
Resident doctors **Dr. Puja Chatterjee** **Dr. Anirban Dasgupta** **Dr. Chandrima Ray** **Dr. Sreeya Bose** **Dr. Jamirul Islam**	 **Senior resident** **Senior resident** **Senior Resident** **Project Consultant (Preventive oncology)** **Junior resident**

Objectives of the Department

- Diagnostic work up of women with suspected gynecological cancers
- Appropriate management through surgery, chemotherapy and radiation therapy and their combinations
- Screening and early detection of Gynecological cancers
- Palliative treatment for gynecological cancer patients
- Generate trained human resources in early detection and effective management of Gynecological cancers
- To conduct research and training workshops in the field of Gynecological Oncology

Clinical activities of the Department

During the period between 1st April 2020 and 31st March 2021 a total of 1042 new cases were registered in the Department which is less compared to 2019-2020 due to COVID-19 pandemic. During the same period a total of 987 patients attended the OPD for follow up visits.
The diagnoses of patients according to the site are given in Table1.

Table 1: The number of new cases attended OPD during 2020-2021

Type of cancer	Number of new cases	Percentage
Cervix	**169**	**42.7**
Ovary	**121**	**30.6**
Uterus	**32**	**8.2**
Vulva	**12**	**3**
Vagina	**4**	**1**
GTD	**3**	**0.7**
Ca urethra	**1**	**0.3**

Benign uterine disease	**12**	**3**
Benign cervix lesion	**17**	**4.5**
Benign ovarian tumour	**18**	**4.5**
Benign vulval lesion	**2**	**0.5**
Abdominal kochs	**4**	**1**
Total	**395**	**100%**

The total number of patients admitted under the Department for treatment was 229.

During 2020-2021 a total 143 major surgical procedures were performed in the department. The details of the procedures are given in Table 2.

Table 2: List of major surgeries in the department during 2020-2021

Surgical Procedure	**Number**
Ca cervix	**11**
Ovarian tumour (benign/borderline/malignant)	**90**
Ca endometrium	**15**
Benign Uterine tumour	**5**
Ca vagina	**0**
Surgery for ca Urethra	**0**
Ca Vulva	**10**
Others (EUA+secondarysuturing+cervicaldilatation+surface deposits removal)	**7**
Laparoscopic surgery	**1**
Burst Abdomen Repair	**2**
Colostomy/ileostomy for intestinal obstruction	**2**
Colostomy reversal	**1**
RVF repair	**0**
Total	**144**

The total number of minor surgical procedures carried out in the Department was 697. The details are given in Table 3.

Table 3: The list of minor surgeries in the department during 2020-2021

Procedures	**No of cases**
Cystoscopy	**6**
Hysteroscopy + D/C Endometrial Biopsy	**2**
D/C (Endometrial biopsy/endocervical curettage)	**19**
Endometrial pipelle sampling	**36**
Pyometra Drainage	**28**
Cervical Biopsy	**240**
LEEP (Loop Electro-surgical Excision Procedure)	**25**
Thermo Coagulation	**122**
Polypectomy + D/C Biopsy	**7**

Vulval Biopsy	**6**
Wound debridement ± Secondary suturing	**7**
Pleural Tapping	**14**
Peritoneal tapping	**106**
Vaginal biopsy	**5**
Chest drain	**18**
Urethral biopsy	**2**
Colposcopy	**54**
Total	**697**

Departmental Academic work

- Multidisciplinary tumour board (MDT): conducting weekly MDT in presence of Medical oncologists, Radiologists, Radiation oncologists, Pathologists, Palliative care specialists, to discuss different gynecological oncology cases and decision for further management. The data is entered in Redcap software and also discussion done using Redcap. The recommendation and decision is maintained in the software which can be access anytime.
- Grand rounds discussion done weekly regarding the admitted ward patients. The discussions done like course of hospitalization, need for any recommendation and further treatment etc.
- Monthly virtual **IGCS ECHO tumour board discussion** in presence of Local/National and international faculty in the field of Gynecological oncology, radiation oncology, medical oncology, Oncopathology, surgical oncology, radiodiagnosis.
- Data maintenance of morbidity and mortality data as per ESGO ovarian cancer operative report, surgical list, surgical photo documentation, any rare cases, cancer related specific complications and its outcome, cancer survivor records, etc
- Genetic counselling for hereditary ovarian and breast cancers
- During this Covid 19 pandemic, we have generated departmental email (gynonco@gmail.com) for our patients for regular follow up with reports and also telephonic consultation if required.

Training workshops

1. DNB trainees of broad and super specialties of Gynaecology, Radiotherapy and Surgical Oncology are trained by means of regular seminars, bedside lectures

2. Colposcopy workshops held at CNCI in collaboration with West Bengal Government for master training of various Gynecologists from the state Government service

Date of workshop	Number of patients
7/12/2020 and 8/12/2020	**24**
14/12/2020 and 15/12/2020	**25**
21/12/2020 and 22/12/2020	**24**
28/12/2020 and 29/12/2020	**21**
4/1/2021 and 5/1/2021	**21**
18/1/2021 and 19/1/2021	**23**
1/2/2021 and 2/2/2021	**18**
8/2/2021 and 9/2/2021	**28**
22/3/2021 and 23/3/2021	**18**

3. Cervical cancer screening camp along with awareness programme for genetic counselling for hereditary cancers was conducted in Siliguri, Tea Garden on 24/2-25/2/2021. Around 35 patients were screened for the cervical cancer.

4. Colposcopy workshop at CNCI in collaboration with Bengal Obstetrics and gynecology society on 6/3/2021.

Research activities in the department

Community Based Cervical Cancer Screening Programs of the Department

Integrated project on Non communicable diseases (IPNCD) (Principal Investigator: Dr. Ranajit Mandal)

1. The project started in May, 2017 to assess the feasibility of a comprehensive non communicable diseases screening approach for women in collaboration with International Agency for Research on Cancer, WHO that includes cervical screening on self-collected vaginal samples. Despite of increasing trend of Covid 19 pandemic and lockdown period, the cancer screening was being continued in different districts in collaboration with various NGOs of the locality. The vaginal smear were obtained by self-sampling by the women themselves. Between April 2020 to March 2021, total 5875 women aged between 30-60 years have been recruited in this project of which 268 women screened positive with HC2. Out of the screen positive women, 183 underwent Colposcopic examination by AI in the hospital followed by treatment using thermocoagulation (122 cases), LEEP (25 cases) and hysterectomy (2). Histological report revealed Normal (154), CIN I(15), CIN II (8), CIN III (1), Inadequate/not done (5), respectively.

2. **INTERLACE**: A phase III multicentre trial of weekly induction chemotherapy followed by standard chemoradiation versus standardchemoradiation alone in patients with locally advanced cervical cancer **Sponsor: UCL**, PI- Dr Ranajit Mandal. One patient recruited and already undergoing the trial treatment.

3. A Phase-II/III, Partially Double-blind, Randomized, Active-controlled, Multi-centric Study to Assess the Immunogenicity and Safety of SIIPL's qHPV Vaccine administered Intramuscularly in Healthy Volunteers according to a Two-dose Schedule to Cohort 1 (Girls and Boys Aged 9-14
years) and a Three-dose Schedule to Cohort 2 (Females and Males Aged 15-26 years) as Compared to Merck's HPV6/11/16/18 vaccine (Gardasil®), PI- Dr Dipanwita Banerjee (till January 2021), present PI- Dr Ranajit Mandal

4. Prevention and screening innovation project towards elimination of cervical cancer. (Horizon 2020 project in consideration for DBT cofounding)-PRESCRIP TEC
Lead organization- University of Groningen, Netherlands.
Consortium- 18 partners from 7 countries (4 LMICs + 3 HICs)
Partners from India- 7 organization from India including **CNCI**, MAHE as lead partner
Project duration- 3 years, DBT co-funding

5. **Feasibility and Acceptability of two dose quadrivalent Human papillomavirus vaccine for adolescent girls in rural parts of West Bengal- A pilot study (Principal Investigator- Dr. Dipanwita Banerjee)**

The HPV vaccination project started in July, 2017 in association with Rotary International Initiative is a community-based HPV vaccine project. The project is the first community-based demonstration project in eastern India to assess the feasibility and acceptability of two dose HPV vaccination in rural population of West Bengal. Total 1664 girls between 9-14 years were recruited in this project (Phase 1 and Phase 2) and received their two-dose vaccination till February, 2021. No serious adverse effects were reported.

Dr. Asima Mukhopadhyay

Current grants and research projects:

- PI: HR-HIPEC (translational and clinical trial): HIPEC in Homologous Recombination Stratified Ovarian Cancer- KolGoTrg study (Funding: Welcome Trust DBT IA 2020-2025)- GCIG badged
- PI: PROVAT 1 (project ovarian translational) study: Investigating BRCAness in epithelial ovarian cancer in India. Grant -DST-UKEIRI funding initiative (2017-2021, £ 198,000.00)
- PI: IPIROC (translational and clinical trial): Intermittent PARP inhibitor in recurrent ovarian cancer. KolGoTRg study (Funding: CRUK- DBT seed funding, £30,000- full funding application in process for £ 1.5 million GBP)-GCIG badged
- Country PI: INTERLACE multicentric RCT (GCIG-CCRN) in cervical cancer
- Country PI (India): SENTICOL3: International validation study of sentinel node biopsy in early cervical cancer: A GINECO, ENGOT and GCIG study.
- PI: NuGenA: Nurse led Genetic counselling in improving Awareness and implementation of screening services for hereditary women's cancer- submitted to NIHR GACD call (2020)- 2.5 million GBP
- Co-I: Role of Endoplasmic Reticulum (ER) stress induced UPR signalling in regulating the metabolic fitness and functionality of CD8+ T cells in cancer(translational)- Wellcome Trust IA fellowship project
- Co-PI: HOTROC: A Phase II Randomised controlled study of Aromatose Inhibitor versus Megestrol acetate in patients with recurrent ovarian cancer with biochemical recurrence: collaboration with SGCCRI, Kolkata

Workshops and conference attended

Dr Ranajit Kumar Mandal

1. Invited Faculty in various National and International virtual Conferences, webinars and workshops 2020-2021

Dr Manisha Vernekar

1. Invited Faculty in BOGSYuvacon 2021, in January 2021
2. Attended various National and International virtual conferences, webinar and CME's

3. Part of the Organizing team and conducted TOT Master trainer workshops on colposcopy and LEEP training of Doctors and Nurses at CNCI in association with NHM cell of The West Bengal Govt .
4. Enrolled in **International Gynecologic Cancer Society fellowship training programme** for the year 2021-2023 under the Mentorship of Dr AsimaMukhopadhayay and Dr Ranajit Mandal**,** first IGCS fellowship training in India
5. Obtained **DNB** (obstetrics and gynecology) degree in March 2021.

Dr Dipanwita Banerjee

1. Delivered 1st Yuvacon Oration on The Cervical Cancer Elimination: how can we achieve it organized by The Bengal Obstetrics and Gynaecological Society, January, 2021

2. Invited faculty as a speaker in Webinar series on Pre malignant lesions of Female genital tract Organized by AOGIN India August-October, 2020

3. Invited Faculty as a speaker on Hormone therapy in Gynacological Cancers organized by FOGSI-ICOG-Odisha Chapter of AGOI in December, 2020

4. Invited faculty as a speaker in the webinar on cervical pre cancer organized by Indian Society of Colposcopy and Cervical Pathology in September, 2020

5. Part of the Organizing team and conducted TOT Master trainer workshops on colposcopy and LEEP training of Doctors and Nurses at CNCI in association with NHM cell of The West Bengal Govt .

Achievement:

Got selected and joined for the MCh course in Gynaecological Oncology in The All India Institute of Medical Sciences, New-Delhi.

Dr Puja Chatterjee

1. Invited Faculty in BOGS Yuvacon 2021, in January 2021
2. Attended various National and International virtual conferences, webinar and CME's
3. Attended and completed the **IMPACT (Integrated Module of Palliative Care in Cancer Treatment)** Course Batch 4 on 22nd & 23rd April 2021 for Oncology professionals by Cipla Palliative Care and Training Centre, Warje, Pune, Maharashtra (IN) in collaboration with SAARC Federation of Oncologist.
4. **IFCPC-IARC training course in colposcopy and the prevention of cervical cancer** – Ongoing since May 2020

Dr Chandrima Ray

1. Attended various virtual webinars and conferences in gynecological oncology.
2. Part of the Organizing team and conducted TOT Master trainer workshops on colposcopy and LEEP training of Doctors and Nurses at CNCI in association with NHM cell of The West Bengal Govt.

Dr Sreeya Bose

1. Attended colposcopy training. Participated in organising and conducting screening for cervical cancer at Siliguri Workshop
2. Participated as a team member in the Vaccination camp for cervical cancer prevention organised by Rotary Club at PACE Universal School, Piyali.
3. Attended various webinars and virtual conference including BOGS YUVACON.

Publications

1. Mandal R; Ghosh I; Banerjee D; Mittal S; Muwonge R; Roy Ci; Panda C; Vernekar M; Frappart L; Basu P. Correlation Between p16/Ki-67 Expression and the Grade of Cervical Intraepithelial Neoplasias. International Journal of Gynecological Pathology. 39 (4), July 2020: 384-390.
2. Banerjee, D., Mandal, R., Mandal, A., Ghosh, I., Mittal, S., Muwonge, R., Lucas, E., Basu, P. A Prospective Randomized Trial to Compare Safety, Acceptability and Efficacy of Thermal Ablation and Cryotherapy in a Screen and Treat Setting. Asian Pacific Journal of Cancer Prevention, 2020; 21(5): 1391-1398. doi: 10.31557/APJCP.2020.21.5.1391
3. Ranjit Manchanda, Li Sun, Shreeya Patel, Olivia Evans, Janneke, Wilschut, Ana Carolina de Freitas Lopes, Faiza Gaba, Adam Brentnall, StephenDuffy, Bin Cui, Patricia Coelho de Soarez, Zakir Husain, John L Hopper, Zia Sadique, **Asima Mukhopadhyay**, Li Yang, JohannesBerkhof, Rosa Legood. Global Economic Evaluation of Population-based BRCA1/BRCA2 Mutation. Cancers (manuscript accepted for publication)
4. Vernekar M, Mandal A, Singh G, Banerjee D, Mandal R. Primary Synchronous Neuroendocrine, adenocarcinoma and squamous cell carcinoma of cervix- A case report. Journal of Surgical Procedures and case reports 2021, (1):1-3
5. ASCO resource stratified guideline on management of ovarian cancer- manuscript under preparation
6. https://gcigtrials.org/system/files/Phase%20II%20Committee_FINAL_slides%2026May 2020.pdf
7. Singh P, Ray C, Mandal R. Experience with women having uterine cancer in eastern India: A hospitalbased study. Int J Reprod Contracept Obstet Gynecol. 2020 Aug; 9(8).
8. Chatterjee P, Banerjee D, Vernekar M, Mandal R. Primary vaginal clear cell adenocarcinoma: Case report with literature review. Scholars Journal of Medical Case reports. April 2021; 9(4):393-97.
9. Chatterjee P, Dey Rupali, Banerjee D, Vernekar M. Point Prevalence study of communicable and Non- communicable disease and cervical cancer screening in female sex workers (FSW) in an Urban area of eastern India
10. Banerjee, D., Mandal, R., Mandal, A., Ghosh, I., Mittal, S., Muwonge, R., Lucas, E., Basu, P. A Prospective Randomized Trial to Compare Safety, Acceptability and Efficacy of Thermal Ablation and Cryotherapy in a Screen and Treat Setting. Asian Pacific Journal of Cancer Prevention, 2020; 21(5): 1391-1398. doi: 10.31557/APJCP.2020.21.5.1391
11. Mandal, R., Banerjee, D., Gupta, K., Chatterjee, P., Vernekar, M., Ray, C. Experience of Human Papillomavirus Vaccination Project in a Community Set Up-An Indian

Study. Asian Pacific Journal of Cancer Prevention, 2021; 22(3): 699-704. doi: 10.31557/APJCP.2021.22.3.699

12. Sarkar S, Vernekar M, Chatterjee P, et al. An observational study of clinical characteristics and outcomes of Indian ovarian carcinoma patients undergoing surgery and chemotherapy: a tertiary care hospital report. Supportive Care in Cancer. EMID:a27f867c12e3820d
13. Sarkar S, Pal R, Mahata S, Sahoo.P, Ghosh S, Chatterjee P, Vernekar M, et al. Assessment of pain scores in advanced ovarian carcinoma patients receiving standard chemotherapy. Submitted in Journal of Gynecologic Oncology.

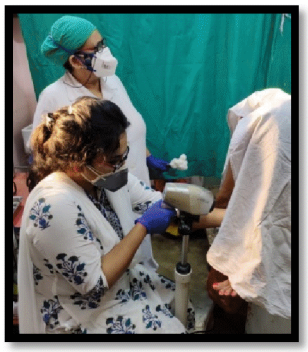
Cancer awareness programme held at Bagnan, Howrah district on National Cancer awareness Day, November 2020

Cervical Cancer vaccination Project (HPV vaccination awareness programme)

Cervical and breast cancer screening and awareness programme organized by CNCI gynecological department in collaboration with FOGSI and BOGS, on International Women's Day, March 2020.

Cervical cancer screening and awareness programme held at Tea Garden, Siliguri in collaboration with KolgoTrg

HPV vaccination drive



Colposcopic examination for cervical cancer screening

Dept. of Medical Oncology

DR. KALYAN.K.MUKHERJEE Associate Prof. & Head of Medical Oncology.

DR.PARTHA NATH—CMO grade

CONSULTANT (CONTRACTUAL)
DR. TANUSHREE PAUL (Mar'2019), DR. RONTI GHOSH (Sep'2020)
MEDICAL OFFICER (CONTRACTUAL)
DR. SHUVAM HALDER
SR. RESIDENT
DR. PINAKIN TANDEL, DR. PRIYANKA BISWAS
JR. RESIDENT
DR. SUMAN JANA , DR. RAYA BANERJEE,
DR. RIZWAN, DR. FATEMA

TREATMENT REPORT

PATIENT STATUS: Total no. patient attending the OPD in 1 year (including new patients, Follow up and patients receiving chemotherapy) ----- **14316**

No. of new patient registered in the dept. -------- **305**

Patient referred from other dept. for chemotherapy--- **1670**

Total no. of patient in indoor--- **1630**

No. of patient received treatment in day care services--- **2485**

PAEDIATRIC ONCOLOGY:-

A new 9 bedded Paediatric Ward opened on 04-Feb-2013. Arrangement of modern treatment facilities with isolation care has been made in this ward. Different non Govt. organization attended the Paediatric patients in the ward through Counseling, Play therapy and with different self activities within the child

No. of paediatric patient admitted in Paediatric ward - **117**

No. of Paediatric Patient in OPD - **321**

No. of new Paediatric cases - **37**

Total No. of new patient admitted - **19**

No. of Total Paediatric Patient:- ---- **438**
(OPD+IPD)

No. of Leukemia Patient

Acute Lymphoblastic Leukemia ---- **46**
Acute Myeloid Leukemia ---- **3**
Chronic Myeloid Leukemia ---- 1

No. of Paediatric Lymphoma Patient:- 10

Paediatrc Solid Tumors:

Rabdomyosarcoma------ **3**
Retinoblastoma---------- **1**
Ewing's sarcoma ------- **3**
CA Colon---------- **1**
Osteosarcoma---------- **3**
Pilocytic Astrocytoma ---------- 1
Neuroblastoma---------- **1**

Status of Total (Adult & Paediatric) patients undergone treatment Leukemia-

Acute Lymphoblastic------- **12**
Myeloid---- **2**
TOTAL---- **14**

CHRONIC CML----- **12**
CLL----- **2**
TOTAL--- **14**

LYMPHOMA------

Hodgkin's disease ------ **47**
Non Hodgkin's diseases---- **63**

Multiple Myeloma----- **15**

Adult Solid Tumors:

Gynecological Tumor
Ovary----- **179**
Vulva ----- **3**
Cervix ---- **15**
GTT -------- **11**

Other Primary site:

Head and neck tumor--- **52**

Breast------ **734**

Lung---------- **62**

Stomach---------- **64**

Esophagus---------- **13**

Colo rectum---------- **101**

Anal canal---------- **6**

Gall bladder---------- **41**

Urinary Bladder---------**18**

Testis ---------- **8**

Kidney ----------**23**

Training- DNB students of Radiotherapy attended Medical Oncology Department Clinical Work on rotational basis in each year.

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Academic Contributions of Dept of Medical Oncology, CNCI, Kolkata

Original Studies:

1. "**Significance of minimal residual disease detection by flow cytometry in Paediatric B cell ALL treatment in tertiary care centre in Eastern India** ." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), 19(4), 2020, pp. 11-15, **India**. https://iosrjournals.org/iosr-jdms/papers/Vol19-issue4/Series-2/C1904021115.pdf
   Kalyan K Mukherjee , Debasish Banerjee , Anjan Das , Subham Halder , Dattatreya Mukherjee , Shyam Sundar Mondal , Surya Kanta Roy , Mili Das, Chinmay Kumar Panda ,Utpal Choudhury

2. **Correlation of Minimal Residual Disease Detection in Paediatric B Cell All Patient with Their Overall Survival and Prognosis- Experience in Tertiary Care Centre in Eastern India.**" IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), 19(5), 2020,PP 1-08, **India** (Journal Publication)https://www.iosrjournals.org/iosr-jdms/papers/Vol19-issue5/Series-1/A1905010108.pdf
   Kalyan K Mukherjee , Debasish Banerjee , Anjan Das , Subham Halder , Dattatreya Mukherjee , Shyam Sundar Mondal , Surya Kanta Roy , Mili Das, Chinmay Kumar Panda ,Utpal Choudhury

Literature Review:

1. "**A Review on Therapeutic Strategies of Relapsed and Refractory Multiple Myeloma.**" OSF Preprints. February 8. doi:10.31219/osf.io/bfj4z. [Citation 1]Dattatreya Mukherjee and Kalyan K. Mukherjee, Utpal Choudhuri. 2021.

Abstract Publication:

1. Kalyan Kusum Mukherjee, Dattatreya Mukherjee. **Role of tumor heterogeneity, tumor microenvironment and tumor initiating cell in gastric carcinogenesis from the perspective of development of hypothesis for its clinical application** [abstract]. In: Proceedings of the AACR Virtual Special Conference on Tumor Heterogeneity: From Single Cells to Clinical Impact; 2020 Sep 17-18. Philadelphia (PA): AACR; Cancer Res 2020;80(21 Suppl):Abstract nr PO-011 (Scopus indexed Q1, Web of Science Indexed IF: 12.7)

2. Kalyan K Mukherjee et al. **Significance of detecting Minimal Residual disease by Flow Cytometry on overall Survival and prognosis of Pediatric B Cell ALL patient-Experience in a tertiary care center in Eastern India**, Abstract Publication, Indian Journal of Medical and Pediatric Oncology, Scopus Q3 [Accepted, In Press]

3. Mukherjee, Dattatreya and Mukherjee, Kalyan Kusum**. Recent Advances in PI3K Inhibitor HR+/HER2- Advanced Breast Cancer, A Review Article** (August 10, 2020). ICABEE-BIO-2020, Available at SSRN: https://ssrn.com/abstract=3672430

Google Patent

1. Dattatreya Mukherjee,SUFIA IMAM,Kalyan **K Mukherjee "USE OF JAK STAT PATHWAY BLOCKER TO TREAT COVID19 PATIENTS- THE FUTURE OF COVID19 TREATMENT"**, International Journal of Creative Research Thoughts (IJCRT), ISSN:2320-2882, Volume.8, Issue 6, pp.127-131, June 2020, Available at :http://www.ijcrt.org/papers/IJCRT2006024.pdf **Authorized by FDA on Nov 19th 2020, https://www.medscape.com/viewarticle/941324) Indexed In WHO COVID19 Database :https://search.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/resource/en/ppcovidwho-1504 Indexed In Europe PMC:** PPR242621 **Preprint in SSRN:** 10.2139/ssrn.3623965 **Google Patent:** https://patents.google.com/scholar/17255439439733925130 **Citation: 1**

Conference Poster and Presentations:

1. Kalyan Kusum Mukherjee, Dattatreya Mukherjee. **Role of tumor heterogeneity, tumor microenvironment and tumor initiating cell in gastric carcinogenesis from the perspective of development of hypothesis for its clinical application** [abstract]. In: Proceedings of the **AACR** Virtual Special Conference on Tumor Heterogeneity: From Single Cells to Clinical Impact; 2020 Sep 17-18. **Philadelphia** (PA): AACR; Cancer Res 2020;80(21 Suppl):Abstract nr PO-011

Invited Lecture & Oral Presentation by Dr. Kalyan K Mukherjee:

1. **Genetic Profiling in Solid Tumours-Case Series of Three Cases American Society of Clinical Oncology (ASCO) Annual Meeting 2021 (Medical Student and Resident Forum)**
   Kalyan K Mukherjee, Dattatreya Mukherjee, Priyanka Biswas, Pinakin Tandel, Ronti Ghosh, Chirantan Bose,

2. **Significance of detecting Minimal Residual disease by Flow Cytometry on overall Survival and prognosis of Pediatric B Cell ALL patient-Experience in a tertiary care center in Eastern India (Poster),** Annual Conference of Indian Society of medical oncology and pediatric oncology ISMPOCON 2020, **India** (Poster Publication) (Top 15 abstract publication. Kalyan K Mukherjee, Dattatreya Mukherjee

3. **Recent Advances in PI3K Inhibitor HR+/HER2- Advanced Breast Cancer, A Review Article** (August 10, 2020). ICABEE-BIO-2020, Available at SSRN: https://ssrn.com/abstract=3672430 [Abstract Accepted but Conference Cancelled due to COVID 19 pandemic]Mukherjee, Dattatreya and Mukherjee, Kalyan Kusum,

4. **A Review on Therapeutic Strategy on Relapsed and refractory Multiple Myeloma,** The Indian Myeloma Congress-4th International Conference from IMAGe, Sanjay Gandhi Post Graduate Institute of Medical Sciences
Kalyan K Mukherjee, Dattatreya Mukherjee, Priyanka Biswas, Pinakin Tandel, Ronti Ghosh,

5. **EVOLVING CONCEPTS IN HER2 EVLUATION IN BREAST CANCER: HETEROGENIETY,HER-2 LOW CARCINOMAS AND BEYOND, Virtual Congress on Breast Cancer Research,** Italy (Slides: https://www2.slideshare.net/DattatreyaDATMukherj/evolving-concepts-in-her2-evaluation-in-breast-cancer Kalyan K Mukherjee, Dattatreya Mukherjee

Name of the Department: Department of Medical Physics

Head of the Department: **Dr. Dilip Kumar Ray**

Team

Name	Designation
Faculty with Educational Qualification	
Dr. Dilip Kumar Ray, M.Sc. (Gold Medalist), Ph.D (JU), Dip.R.P (BARC), AERB Award	Head, Department of Medical Physics Physicist (Scientist – 3)
Shri Dillip Kumar Misra, M.Sc., Dip.R.P (BARC)	Physicist (Scientist – 2) Radiological Safety Officer
Shri Atanu Kumar, M.Sc., Dip.R.P (BARC)	Physicist (Scientist – 2) Radiological Safety officer
Shri Rajib Das, M.Sc., Dip.R.P (BARC)	Physicist (Scientist – 2)
Shri Bijan Kumar Mohanta, M.Sc., Dip.R.P (BARC)	Physicist (Scientist – 2)
Medical Physics Intern	
Ms. Sanchita Chakrabarty	Intern
Ms. Paramita Sil	Intern
Shri Pijus Kanti Ghosh	Intern
Ms. Lona Samanta	Intern
Ms. Sujata Mondal	Intern
Medical Physics Students	
Shri Suman Mitra	
Ms. Lona Samanta	
Shri Pijus Kanti Ghosh	
Shri Prosenjit Soren	
Ms. Sanchita Chakrabarty	
Shri Arka Rudra Kar	
Ms. Paramita Sil	
Ms. Manjulika Bhattacharjee	
Shri Soumik Gain	
DRT Tech Students	
Mr. Subhankar Baidya	2nd year DRT Tech student
Mr. Pritam Nebu	2nd year DRT Tech student
Ms. Paulomi Mondal	2nd year DRT Tech student
Ms. Riya Patra	2nd year DRT Tech student
Ms.Sneha Pakray	1st year DRT Tech student
Shri Sujan Maity	1st year DRT Tech student
Ms. Shreyashi Bhandari	1st year DRT Tech student
DRD (Tech) Students	
Abhishek Mondal	2nd year DRD Tech student

Sourav Das	2nd year DRD Tech student
Debraj Halder	2nd year DRD Tech student
Masud Alam	2nd year DRD Tech student
Sumit Sardar	2nd year DRD Tech student
Satyaki Das	1st year DRD Tech student
Akash Chakraborty	1st year DRD Tech student
Sagar Kundu	1st year DRD Tech student
Jeba Nasrin	1st year DRD Tech student
Debjani Gharami	1st year DRD Tech student

Objectives of the department:

Radiation Treatment planning, accurate and precise dose delivery to patient, radiation dosimetry, dose calculation, Calibration, Quality Assurance, maintenance of the teletherapy and Brachytherapy machines, procurement and disposal of radioactive sources and finally ensuring radiation safety for the patient, staff and public and implementation of radiation protection rules as per Atomic Energy Regulatory Board guidelines are some of the important functions of the department. The department actively involves in medical physics research, education and training of medical and paramedical courses. International standards of dosimetry are maintained by participating in international IAEA/BARC dose inter-comparison Programme.

This department is equipped with one state of the art Dual Energy Linear accelerator (**ELEKTA Synergy**), one state of the art Low energy Linear accelerator (**Elekta Synergy Platform**) , Two Ir-192 HDR after-loading brachytherapy machine (One **Integrated brachytherapy unit and one Flexitron**), and one state of the art 16 slices CT- Simulator (**Wipro-GE**). The department is equipped with many sophisticated equipments like treatment planning systems TPS (**CMS-XIO-1, Monaco- 3, and 3D Brachy Oncentra- 2**), dosimeters and calibration instruments like Unidos E electrometers,3-D RFA water phantom (**MP3-M,PTW**), fluence analysis dosimetry system (**2D array & Octavious 4D**), Film dosimetry system etc.

The department is actively involved in dosimetry, data acquisition of various teletherapy machines like Telecobalt and linear accelerators. Treatment Planning and dosimetry verification of state of the art radiotherapy treatment techniques like 3D conformal treatment with Multileaf collimator (MLC), Intensity Modulated Radiation therapy (IMRT), Image guided Radiation therapy (IGRT), Volumetric Modulated Arc therapy (VMAT) and SBRT treatments. We also involve in Brachytherapy planning like ICRT, ILRT, Surface Mould and Interstitial Implants (Head and Neck, Breast etc). This department is responsible for calibration and Quality assurance of the radiation therapy machines. We are also involved in radiation protection and QA of X-Ray, Mammography and CT-Scan of Radio-diagnosis department.

Our department runs Post M.Sc. Diploma course in Medical Physics and actively involved in teaching of other courses like DNB Radiotherapy, paramedical courses like DRT (Tech) and DRD (Tech) courses. This department is actively involved in research in Medical Physics also.

Brief description of the Clinical/Technical work done during the year:

No. of External conformal treatment planning : 118
No. of conventional treatment Calculation : 392
No. of Brachytherapy treatment Cases : 131
No. of CT- simulation : 190

Quality Assurance tests, Radiation protection and e-LORA compliance as per AERB Guidelines of the following machines:

- Two Linear Accelerators,
- Four 3D EBRT and Two 3D Brachytherapy Treatment Planning Systems,
- Two Brachy therapy Machine,
- One CT Simulator
- One Mammography
- Two X-ray machine.

Academic Activities:

Following academic programs are undergoing in the Department:

- Post M.Sc. Diploma course in Medical Physics in collaboration with Jadavpur University.
- Ph.D in Medical Physics under affiliation of West Bengal university of Health Sciences.
- Teaching faculty of DNB Radiotherapy.
- Teaching faculty of Ph.D course.
- Teaching faculty of Diploma in Radio therapeutic Technology (DRT-Tech) and Diploma in Radio-diagnosis Technology (DRD-Tech).
- Internship in Medical Physics.
- Internship in DRT(Tech.)
- Clinical training of DRT (Tech) students from other institutes.

No. of candidates admitted in Post M.Sc. Diploma Course in Medical Physics = 10

No. of candidates passed Post M.Sc. Diploma Course in Medical Physics = 10

No. of Medical Physics Interns admitted : 5

No. of candidates admitted DRT-Tech course : 4
No. of candidates passed DRT-Tech course : 4
No. of DRT (Tech) students admitted for internship : 4
Imparted clinical training to Eight (8) DRT (Tech.) trainees from various Govt. Medical Colleges of West Bengal.

Achievement:

-Commissioned one Linear Accelerator (Elekta, Synergy Platform) and Monaco 3D Treatment Planning System).
- One newly procured Telecobalt machine (Bhabhatron, Panacea) is under installation and commissioning.

DNB Theses (Co-Guide) :

1. A thesis titled "A study on high grade glioma using Intensity Modulated Radiotherapy by Simultaneous Intensity Boost vs Sequential boost" is currently being done by DNB student, Dr Patibandla Srikanth.
2. A thesis titled "A prospective study on Image guidance with cone beam CT for 3DCRT of Cancer Cervix" is currently being done by DNB student, Dr. Arya R M.
3. A thesis titled "Dose escalation in esophageal cancer by Simultaneous Integrated Boost Intensity Modulated Radiotherapy technique" is currently being done by DNB student, Dr Christine J Nongram.
4. A thesis titled "A randomized comparative study on hypofractionated verses conventionally fractionated radiation therapy with concurrent chemotherapy with imrt using vmat technique in locally advanced inoperable non-small cell lung cancer" is currently being done by DNB student, Dr. Shambodeep Chatterjee.
5. A thesis titled "Prospective study on hypofractionated intensity modulated radiation therapy (using VMAT thechnique) with concurrent chemotherapy in locally advanced laryngeal and hypopharyngeal squamous cell cancers" is currently being done by DNB student, Dr. Rupak Sett.
6. A thesis titled "A prospective comparative study of imrt (intensity modulated radiotherapy using v-mat technique) verses 3dcrt (three dimensional conformal radiotherapy) with respect to toxicity and loco-regional response in locally advanced cervical carcinoma" is currently being done by DNB student Dr. Sujan Kumar Ghosh

Miscellaneous

- Dr. D. K. Ray, Shri D.K.Misra, Shri Atanu Kumar, Shri Rajib Das and Shri B.K. Mohanta acted as examiner and paper setter of Post M.Sc. Diploma in Medical Physics Course at Jadavpur University.

- Dr. Ray, Shri Atanu Kumar and Shri Rajib Das acted as internal Examiner for DRT (Tech) and DRD (Tech) course.

NAME OF THE DEPARTMENT : PATHOLOGY

HEAD OF THE DEPARTMENT : DR SRABANTI HAJRA

(MD, SPECIALIST GRADE I)

STAFFS OF THE DEPARTMENT

NAME	DESIGNATION
Dr Saunak Mitra Mustafi, MD	Specialist Grade I
Dr Debanjan Ghosh, MD	Specialist Grade II
Dr Dipkana Das, MD	Consultant
Dr Prachi Kukreja, MD	Consultant
Dr Smita Gupta	Medical Officer (In Charge of Blood Centre)
Dr Smarajit Pal, PhD	Biochemist (In Charge of Clinical Biochemistry)
Dr Kaushambi Chakraborty, MD	Senior Resident
Dr Cheryl Majumder	DNB PGT
Dr Hitesh Bucha	DNB PGT
Dr Gaurav Singh	DNB PGT
Dr Jebaunnesa Khatun	DNB PGT
Dr Swapnika Golla	DNB PGT
Dr Afreen Fatima	DNB PGT
Dr Subhadeep Panda	DNB PGT
Dr Raya Banerjee	DNB PGT
Mr Govinda Baidya	SSA
Mr Raja Roy	SSA
Mr Bhagwan Mishra	SSA
Mr Indrajit Ghosh	JSA
Mr Somnath Mondal	SSA
Mr Pradip Bala	JSA
Mr Dinabandhu Das	SSA
Mr Jagadish Mondal	JSA
Mr Tapas Debnath	JSA
Mr Debasish Roy Chowdhury	SSA
Mr Krishanu Seth	JSA
Mrs Rakhi Das Majumder	JSA
Mrs Shailosree Manna	ERS
Mr Purnendu Roy	GDA
Mr Bhola Pal	Lab Helper
Mr Sougata Ghosh	Lab Technician
Mr Samaresh Acharya	Lab Technician
Mr Chirantan Pal	Lab Technician
Mr Swarnava Kundu	Lab Technician
Smt Riya Sahoo	Lab Technician

OBJECTIVES OF THE DEPARTMENT

1. To provide precise histopathological/cytopathological/hematological diagnosis for different cases and to provide correct pathological staging.
2. To provide biochemical,hematological and clinicopathological diagnosis/follow-up in tumour and non-tumour cases.
3. To provide safe blood (around 3000 units) to indoor and daycare patients of CNCI, Chittaranjan Seva Sadan & Sishu Sadan Hospital.
4. To run DNB pathology course (broad-speciality) NBE, Govt. of India.
5. To pursue clinical research work in the field of tumour pathology.

ANNUAL REPORT OF HISTOPATHOLOGY

SERIAL	SITE	MALIGNANT	BENIGN
1	Breast	403	52
2	Oral Lesion	548	97
3	Skin	29	06
4	Lymph Node	73	11
5	Soft-tissue	37	04
6	Thyroid	08	04
7	Thymus	01	NIL
8	Lung	11	02
9	Larynx	12	03
10	Bone	04	02
11	Stomach	25	04
12	Colon	41	05
13	Pancreatico-biliary	19	06
14	Omentum	04	NIL
15	Salivary gland	06	02
16	Ovary	90	07
17	Uterus	55	06
18	Cervix	202	33
19	Kidney & urinary bladder	18	03
20	Testis	04	02
21	Penis	10	02
22	Brain	03	NIL
TOTAL		**1603**	**251**

ANNUAL REPORT OF CYTOPATHOLOGY

SERIAL	SITE	MALIGNANT	BENIGN
1	Breast	50	13
2	Oral Lesion	10	02
3	Skin	19	08
4	Lymph Node	185	29
5	Soft-tissue	18	05
6	Thyroid	21	06

7	Lung	07	01
8	Bone	03	01
9	GI Tract	07	01
10	Pancreatico-biliary	155	07
11	Salivary gland	08	02
12	Female genital tract	32	05
13	Kidney & urinary bladder	08	01
14	Male genital tract	NIL	NIL
15	Ascitic fluid	155	41
16	Pleural fluid	18	04
17	Scrape cytology	03	01
TOTAL		**699**	**129**

TOTAL NUMBER OF FROZEN SECTION : 52

ANNUAL REPORT OF HISTOPATHOLOGY REVIEW SLIDES

SERIAL	SITE	MALIGNANT	BENIGN
1	Breast	213	45
2	Oral Lesion	305	19
3	Skin	42	07
4	Lymph Node	59	09
5	Soft-tissue	38	05
6	Thyroid	27	09
7	Respiratory system	36	05
8	Bone	14	04
9	Stomach	39	06
10	Colon	42	09
11	Gall-bladder	51	12
12	Liver	47	08
13	Pancreas	15	04
14	Salivary gland	11	07
15	Ovary	98	15
16	Uterus	37	13
17	Cervix	166	23
18	Kidney & urinary bladder	18	03
19	Testis	05	NIL
20	Prostate	18	01
21	Penis	05	NIL
22	Brain	10	06
TOTAL		**1296**	**210**

ANNUAL REPORT OF CYTOPATHOLOGY REVIEW SLIDES

SERIAL	SITE	MALIGNANT	BENIGN
1	Breast	60	15

2	Oral Lesion	33	07
3	Skin	NIL	03
4	Lymph Node	54	06
5	Soft-tissue	13	02
6	Thyroid	18	07
7	Respiratory system	49	11
8	Bone	07	02
9	Pancreatico-biliary	58	07
10	Salivary gland	16	04
11	Female genital Tract	06	03
12	Kidney & urinary bladder	02	NIL
13	Male genital tract	03	NIL
14	Ascitic fluid	65	28
15	Pleural fluid	06	03
16	Scrape cytology	02	NIL
	TOTAL	**392**	**98**

ANNUAL REPORT OF CLINICAL PATHOLOGY

1	CBC	11,205
2	Hemoglobin & Total count	398
3	BT & CT	280
4	Serology	707
5	Bone-marrow	07
6	Malarial parasite	05

ANNUAL REPORT OF CLINICAL BIOCHEMISTRY

The unit of clinical biochemistry plays a very important role in performing routine and special biochemical tests.The unit has been functioning with automated sophisticated instruments to perform routine biochemical and electrolyte test of patients attending indoor, outdoor and various clinic in the institute. Beside these activities this unit also engaged in research work in collaboration with different departments of research wing.Clinical biochemistry unit is performing daily internal quality control as well as external quality control (EQAS) in collaboration with CMC Vellore.

SERIAL	TYPE OF INVESTIGATION	TOTAL NO.
1	Sugar (glucose)	8299
2	Urea	10360
3	Creatinine	10362
4	Bilirubin (total)	9570
5	Bilirubin (direct)	9570
6	Alkaline phosphatase	9571
7	SGOT	9569
8	SGPT	9569
9	Total Protein	9571

10	Albumin	9572
11	Electrolytes (sodium, potassium & chloride)	8313
12	Phosphate	235
13	Magnesium	235
TOTAL NO. OF TEST		**104796**
TOTAL NO. OF PATIENT		**10764**

ANNUAL REPORT OF BLOOD CENTRE

Blood Bank CNCI attended the outdoor voluntary blood donation camp for collecting blood units for the hospital. Collected blood units are processed as per blood control rule before issuing the blood to the patient.

1. Total outdoor blood donation camp attended : 24
2. Total blood collected from outdoor camp : 1003 units
3. In-house blood collected : 5 units
4. Total blood collected : 1008 units
5. Total number of requisition served : 711
6. Total blood issued : 854 units
7. Blood received from IBTM & IH and issued after cross-matching : 21 units

ACDEMIC ACTIVITIES

- NATIONAL BOARD OF EXAMINATIONS inspected the department in 2017 and has renewed the accreditation from January 2017 to December 2020.
- Application has been sent for renewal for accreditation of DNB course.
- One primary and one secondary seats have been alloted into this institute last year.
- 04 primary DNB PGTS and 01 secondary DNB PGTS has registered with NBE from this department.
- Regular theory and practical training and seminars are held in the department.

PUBLICATIONS

1. DR SRABANTI HAJRA

- Normotensive incidental pheochromocytoma:report of a rare case with a brief review of literature.Sen S., Hajra S., Bhattacharjee S., Ghosh I., Thakkar D.B., 2020;16(5):432-437

2. DR SAUNAK MITRA MUSTAFI

- Murmu N, Mustafi SM, Mondal S, Ghosh P 2020.Clinicopathological characteristics an incidence of gastric cancer in eastern India:A retrospective study. Journal of gastrointestinal cancer,020-00478.
- Murmu N, Mustafi SM, Ray S, Saha D, Alam N, Mondal S, Sarkar A, Majumder B 2021, Exposure to chewing tobacco promotes primary oral squamous cell carcinoma and regional lymph node metastasis by alteration of SDFI α/CXCR4 axis.International journal of experimental pathology 2021, 00:1-13 https;//doi.org/10.1111/iep.12386

3. DR PRACHI KUKREJA

- Chakrabarti PR, Chakraborty K, Kukreja P. Role of image-guided fine needle aspiration cytology of lung lesions in diagnosis and primary care of patients: Experience in a Government Medical College of Eastern India. J Family Med Prim Care. 2020 Jun 30;9(6):2785-2788. doi: 10.4103/jfmpc.jfmpc_89_20. PMID: 32984126; PMCID: PMC7491830.
- Parekh D, Kukreja P, Mallick I, Roy P. Worst pattern of invasion - type 4 (WPOI-4) and Lymphocyte host response should be mandatory reporting criteria for oral cavity squamous cell carcinoma: A re-look at the American Joint Committee of Cancer (AJCC) minimum dataset. Indian J Pathol Microbiol. 2020 Oct-Dec;63(4):527-533. doi: 10.4103/IJPM.IJPM_662_19. PMID: 33154300.

4. DR KAUSHAMBI CHAKRABORTY

- Chakrabarti PR, Chakraborty K, Kukreja P. Role of image-guided fine needle aspiration cytology of lung lesions in diagnosis and primary care of patients: Experience in a Government Medical College of Eastern India. J Family Med Prim Care. 2020 Jun 30;9(6):2785-2788. doi: 10.4103/jfmpc.jfmpc_89_20. PMID: 32984126; PMCID: PMC7491830.
- Mohapatra D, Chakraborty K, Das D, Biswal R. Significance of HER 2/neu in Gastric Adenocarcinomas, A Clinicopathological correlation. Journal of Medical Science And Clinical Research 2020; 8(4):481-487.

5. DR SMARAJIT PAL

- Sarkar M, Bhuniya A, Ghosh S, Sarkar A, Saha A, Dasgupta S, Bera S, Chakravarti M, Dhar S, Guha I, Ganguly N, Das T, Banerjee S, Pal S, Ghosh SK, Bose A, Baral R. Neem leaf glycoprotein salvages T cell functions from Myeloid-derived suppressor cells-suppression by altering IL-10/STAT3 axis in melanoma tumor microenvironment. Melanoma Res. 2021 Apr 1;31(2):130-139. doi: 10.1097/CMR.0000000000000721. PMID: 33625102.

Name of the Department: Department of Radiation Oncology

Head of the Department: Dr. Tapas Maji, MD, DNB

Team

Name	Designation
Faculty	
Specialists	
Dr. Tapas Maji, MD, DNB	Specialist Grade I (SAG) &Head, Department of Radiation Oncology
Dr. Debarshi Lahiri, MD	Specialist Grade I, Radiation Oncology, and DNB Course Coordinator, CNCI
Dr Kallol Bhadra, MD	Specialist Grade II, Radiation Oncology
Dr. Koustav Mazumder, DMRT,MD,DNB	Specialist on contractual basis, Radiation Oncology
Dr. Palas De, MD, DNB	Specialist on contractual basis, Radiation Oncology
Senior Residents	
Dr.Subhadip Das, DNB	Senior Resident
Dr.Biplab Misra, DNB	Senior Resident
Other Team Members	
Dr. Raka Banerjee, MBBS	Junior Resident
Dr. Abesh Banerjee, MBBS	Junior Resident
Students (DNB Radiotherapy Course)	
Dr.Nitesh Anand,MBBS	Post MBBS DNB Trainee
Dr.Patibandla Srikanth,MBBS	Post MBBS DNB Trainee
Dr.Arya R M,MBBS	Post MBBS DNB Trainee
Dr. Shambodeep Chatterjee, MBBS, DMRT	Post Diploma DNB Trainee
Dr. Christine J Nongram,MBBS	Post MBBS DNB Trainee
Dr. Raka Banerjee, MBBS	Post MBBS DNB Trainee
Dr. Neerajita Paul, MBBS, DMRT	Post Diploma DNB Trainee
Dr. Subhan Riyaz Shaikh, MBBS	Post MBBS DNB Trainee
Radiotherapy Technician	
Mr. Barun Roy Chowdhury	Radiotherapy Technician
Mr. Tapas Kar	Radiotherapy Technician
Mr. Manas Chakraborty	Radiotherapy Technician
Mr. Koushik Ghosh	Radiotherapy Technician
Mr. Prashanta Kr Ray	Radiotherapy Technician
Mr. Sisir Bhawal	Radiotherapy Technician
Ms. Sipra Singh	Radiotherapy Technician
Mr. Dhrubojyoti Ghosh	Radiotherapy Technician

DRT Tech Students	
Mr. Subhankar Baidya	2nd year DRT Tech student
Mr. Pritam Nebu	2nd year DRT Tech student
Ms. Paulomi Mondal	2nd year DRT Tech student
Ms. Riya Patra	2nd year DRT Tech student
Ms. Shreyashi Bhandari	1st year DRT Tech student
Mr. Sujan Maity	1st year DRT Tech student
Ms. Sneha Pakray	1st year DRT Tech student

Objectives of the department:

Comprehensive management of patients under the department of Radiation Oncology including management during course of radiotherapy and chemotherapy, overseeing the treatment planning, evaluation, implementation and their follow-up, decision making and implementation of treatment options regarding clinical management of cancer patients including comprehensive multidisciplinary cancer care and participation in the institutional joint tumor boards.
The department along with the medical physics team is actively involved in delivery of different radiation modalities including radical, palliative and prophylactic treatments for various tumors.
The department is equipped with one state of the art Dual Energy Linear accelerator (ELEKTA Synergy) with electron beam treatment facility, one 16 slice CT simulatorand one Ir-192 HDR after-loading brachytherapy machine (Integrated brachytherapy unit). Besides these, one new low energy(6 MV) Linear accelerator (ELEKTA) machine with IMRT and electron beam treatment facility has been started for service of the patients from March 2021. Furthermore, the 25 years old Tele-Cobalt machine (Theratron 780 C)has been decommissioned and a new Tele-Cobalt machine (Bhabhatron II) is under installation process.

Description of work done

Total no. of Radiotherapy beds = 37

Total no. of Indoor admissions = 288
OPD attendance = 7540

New Cases planned for External Beam Radiotherapy (Computerized + Manual) =510
Brachytherapy : ICRT for Cervix, Vagina and Endometrial cancers = 131

No of CT-simulation = 190

Details of category of new cases received for treatment by the department of Radiotherapy from the existing departments of the institute (*Surgical Oncology, Medical Oncology, ENT H & N Oncology and Gynecological Oncology*):

Main site of cancer	Sub sites / Cancer type / Organ-wise distribution (Number of cases)	Total number of cases	Referred from the department
Skin	-	2	Surgical Oncology
Head & Neck		121	(Surgical Oncology & ENT H & N Oncology)
Lung	-	21	Surgical Oncology& Radiation Oncology
Breast	-	120	Surgical Oncology
G.I System	Esophagus(7)	22	Surgical Oncology
	Stomach (1)		Surgical Oncology
	Colo rectal (13)		Surgical Oncology
	Anal Canal (1)		Surgical Oncology
	Hepatobilliary & Gall B (0)		Surgical Oncology
Gynae/Genitourinary System	Cervix uteri (107)	129	Gynecological oncology
	Endometrium (9)		Gynecological oncology
	Vulva (1)		Gynecological oncology
	Vagina (2)		Gynecological oncology
	Kidney (0)		Surgical Oncology
	Urinary bladder (0)		Surgical Oncology
	Prostate (10)		Surgical Oncology& Radiation Oncology
Lymphoma & Hematological Malignancies	Hodgkin's Lymphoma (1)	10	Medical Oncology
	Non-Hodgkin Lymph (1)		Medical Oncology
	Myeloma/Plasmacytoma (0)		Medical Oncology
	Leukemia (8)		Medical Oncology
Primary tumors of Central Nervous System	Brain & Spinal Cord	14	Radiation Oncology and Surgical Oncology
Soft Tissue Sarcoma	-	8	Surgical Oncology
Others	-	63	All departments

Academic Activities:

Following academic programs are undergoing in the department–

- DNB Radiotherapy affiliated to National Board of Examinations (NBE), New Delhi.
- Diploma in Radio therapeutic Technology (DRT-Tech) and Diploma in Radio-diagnosis Technology (DRD-Tech).
- Internship in DRT(Tech.)
- Clinical training of DRT (Tech) students from other institutes.
- Teaching faculty of Post M.Sc. Diploma course in Medical Physics.
- Internship in Medical Physics**.**

Thesis:

7. A thesis titled "**A study on high grade glioma using Intensity Modulated Radiotherapy by Simultaneous Intensity Boost vs Sequential boost**" has beensubmitted by Dr Patibandla Srikanth (Guide : Dr Tapas Maji, Co-Guide: Dr. Debarshi Lahiri ,Dr. Dilip Kumar Ray) to National Board of Examinations (NBE), New Delhi.

8. A thesis titled "**A prospective study on Image guidance with cone beam CT for 3DCRT of Cancer Cervix**" has been submitted by Dr Arya R M (Guide: Dr Debarshi Lahiri; Co-Guide : Dr.Kallol Bhadra, Dr. Sanjoy Roy, Dr.Dilip Kumar Ray, Mr. Dillip Kumar Mishra) to National Board Examinations (NBE), New Delhi.

Publication:

1. Intensity modulated radiotherapy in carcinoma cervix with metastatic para-aortic nodes: an institutional experience from a Regional Cancer Centre of Eastern India. Reports of Practical Oncology and Radiotherapy. DOI:10.5603/RPOR.a2021.0063.

2. Hypofractionated short-course preoperative conformal radiotherapy versus long course conventional preoperative chemoradiotherapy in the management of locallyadvanced rectal cancer – Prospective randomized comparative study. Panacea J Med Sci 2020;10(3):235-239.

Five Students under Dr. Tapas Maji and two DNB students under Dr. Debarshi Lahiri are undergoing their thesis in the department.

1. A thesis titled "A randomized comaparative study on hypofractionated versus conventionally fractionated radiation therapy with concurrent chemotherapy with IMRT using VMAT technique in locally advanced inoperable non-small cell lung cancer" is currently being done by DNB student, Dr. Shambodeep Chatterjee (Guide: Dr. Tapas Maji).
2. A thesis titled "Dose escalation in esophageal cancer by Simultaneous Integrated Boost Intensity Modulated Radiotherapy technique" is currently being done DNB student Dr. Christine J Nongram (Guide: Dr. Tapas Maji).
3. A thesis titled "Prospective study on hypofractionated intensity modulated radiation therapy (using VMAT technique) with concurrent chemotherapy in locally advanced laryngeal and hypopharyngeal squamous cell cancers" is currently done by DNB student, Dr. Rupak Sett (Guide: Dr. Debarshi Lahiri).
4. A thesis titled "A prospective comparative study of IMRT (Intensity Modulated radiotherapy using V-MAT technique) versus 3CRT (three dimensional conformal radiotherapy with respect to toxicity and loco-regional response in locally advanced cervical carcinoma" is currently being done by DNB student Dr. Sujan Kumar Ghosh (Guide: Dr. Tapas Maji).
5. A thesis titled "A prospective comparative study between conventional fractionated radiotherapy and hypofractionated radiotherapy by using 3D-CRT technique with respect to toxicity and quality of life in postmastectomy breast cancinoma" is currently being done by DNB student Dr. Raka Banerjee (Guide: Dr. Tapas Maji).
6. A thesis titled "Concurrent chemoradiotherapy using volumetric modulated arc therapy with simultaneous integrated boost to the involved para aortic lymph nodes in cervical carcinoma patients: a prospective observational study" is currently being done by Dr. Subhan Riyaz Shaikh (Guide: Dr. Debarshi Lahiri).
7. A thesis titled "A prospective observational study to evaluate anatomic and volumetric changes occurred during fractionated radiotherapy of head and neck cancer" is currently being done by Dr. Neerajita Paul (Guide: Dr. Tapas Maji).

Conference/Symposium/Workshop (International/National) attended

1)Dr. Debarshi Lahiri and Dr. Biplab Misra attended"XIX Annual Meeting (Virtual) on Evidence Based Management of Cancers in India: Technology and Cancer Care- Promise and Reality of the Brave New World", organised by Tata Memorial Center, Mumbai held in Feb, 2021.

Other academic activities

1) Dr. Nitesh Anand successfully passed DNB Radiotherapy from this Institute.

Name of the Dept: Radiodiagnosis

Head

Dr. Suparna Mazumder MD

Specialist Gr I

Team

Contractual Radiologists
Dr. Srabanti Roychoudhury
Dr Sounak Pal
Dr Subhanker Podder

Supporting Staff
Mr. Alok Roy, Technician
Mr. Kamal Ghosh, Technician
Mr. Debapratim Das, Technician

Contractual radiographer

Mr Samrat Chakraborty
Mr Snehasis Maity
Ms Ananya Saha

Objectives

The department is a vital link providing diagnostic support to all the departments in the hospital wing, both OPD and IPD. It plays an important role in patient care services and management – both routine and emergency, of new cancer cases as well as those on follow-up by helping in early detection, diagnosis, intervention, prognosis and follow-up

The department played a vital role in the COVID situation providing X-Ray, USG and HRCT services as and when required. maintaining all the sanitization protocol.

The department also managed installation of many new equipment and also started basic radiological diagnostic services in the new second campus at Rajarhat.

New machines installed :

First campus:

Digital Mobile X-ray- GM85(Samsung) with one detector

USG with Doppler and five probes (RS80EVO) Samsung

Mammography (Analogue- Lilyum BYM) metaltronica

Digital Radiogrphy(Konica Minolta)– Aero DR with one detector

Second Campus:

Installed and functioning

Digital mobile X ray (Carestream) DRX Revolution

USG (WGE) Logic Q P9

Digital Mammography(Hologic) Selenia Dimensions Avia 3000

Installation in progress:

3T MRIwith spectroscopy (M/S Philips), Digital fluororadiography (M/S Siemens) and high end C Arm arealso in their final phases of installation at the second campus.

The current radiological facilities combined at both the campusesinclude the following services:

i) **X-ray –** For general radiography and special procedures

ii) **Computerisd Radiography** system with laser camera for digital films.

iii) **Ultrasonography**- All withcolour Doppler.

iv) **Mammography unit** (analogue and digital model).

v) **Guided(USG)** interventions such as FNAC, biopsy, drainage.

vi) **Review** reporting of imaging (CT/ MRI) done outside.

vii) **CT SCAN**with guided biopsies.

Work done

Ultrasonography with interventions and Mammography

Second campus

Month	No of patient/ cases	USG abd	USG Small parts	Dopp	MMG	FNAC
Feb21	18/21	12	9			
Mar21	14/19	13	5		21	1

First campus

Month	Number of Patient/cases	USG-Abdomen	USG-Small Parts	Doppler	mmg	USG Guided FNAC/Bx
Apr 20	41	29	12	02		22
May 20	33	14	19			19
Jun 20	109	77	32	02		32
Jul20	85	55	30	06		50
Aug20	105	66	39	04		39
Sep20	201	148	53	05		53

Oct20	161	105	56	03		56
Nov20	194	133	61	04	5	61
Dec20	264	203	61	05	21	62
Jan21	261	186	99	10	52-	74
Feb21	204	151	53	07	63-	53
Mar21	286	209	77	02	101-	77
Grand Total	**1944**	**1376**	**592**	**50**	**242**	**598**

Computed Tomography Scans (FirstCampus)

Month	Bx/fna	Patient	Brain	Body	Total Case
Apr-20	0	50	24	86	110
May-	0	72	46	123	169
Jun-	0	116	58	200	258
Jul-	0	172	161	415	576
Aug-	0	136	75	234	309
Sep-	0	215	109	388	497
Oct	1	174	79	288	368
Nov-	0	210	98	414	512
Dec-	2	262	121	507	630
Jan-	1	269	115	530	646
Feb-	1	264	110	528	639
Mach21	3	309	133	605	741
Total	**8**	**2249**	**1129**	**4318**	**5455**

X rays (Firstcampus)

Month	Chest X-Ray	Others	Special Investigations
Apr 20	78	17	0
May	66	6	0
Jun	144	28	0
Jul	124	24	3
Aug	157	25	1
Sep	191	43	1
Oct	173	34	4
Nov	208	38	1
Dec	294	54	3
Jan	257	71	4
Feb	282	76	5
Mar 21	365	62	8
Total Case	**2339**	**478**	**30**

X-rays (Second Campus)

Month	No of Pts	CXR	Extr	Abd
Dec 20	16	16		
Jan 21	12	12		
Feb 21	10	10		
Mar 21	18	14	2	2

In the ongoing COVID pandemic, multiple webinars were attended by the departmental doctors and radiographers.

Multiple online classes were also conducted for the paramedical students of the Institute.

Training Program

1. DNB faculty

PhD program faculty

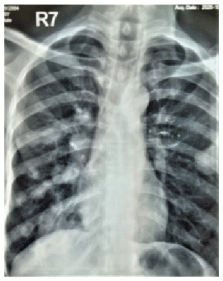
DRD (Tech) & DRT (Tech)- these are two-year Diploma courses for paramedical training run under the aegis of West Bengal State Medical Faculty. All the members of the Department are actively involved in various capacities.

Clinical Trials: CT imaging review for, breast, lung cancers, & colorectal cancers etc for departments like medical oncology, gynae-oncology & others as per RECIST criteria are being done actively.

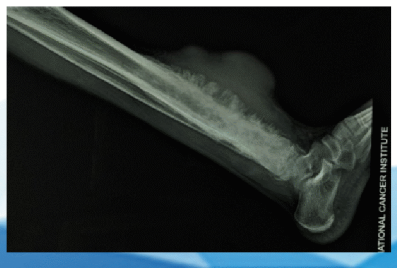
Future Upgradation plans

1. Multi-detector CT scan-128 slice- is due to be installed shortly.
2. OPG machine

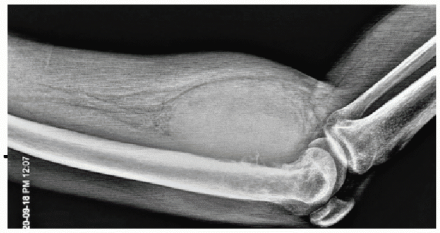
In spite of the COVID pandemic situation, the department performed reasonably well with near comparable CT scans and only 30% reduction in X-rays, Interventions, USGs and Mammograms as compared to the previous year.



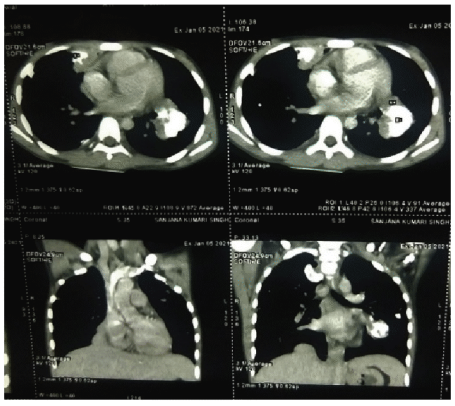
PULMONARY METASTASES



OSTEOGENIC SARCOMA



TUMOR AT KNEE JOINT



CALCIFIC PULMONARY METASTASIS

Department of Surgical Oncology

Constitution of Department of Surgical Oncology

- **FACULTY-**
  1. Dr. Jayanta Chakrabarti. , Director and head of the Department
  2. Dr. Neyaz Alam , Specialist grade I
  3. Dr. Sagar Sen , Specialist grade ll
  4. Dr. Sandip Swarup Mandal ,Specialist grade ll
  5. Dr. Souradip Gupta ,Specialist grade ll
  6. Dr. Indranil Ghosh. CMO (NFSG)
  7. Dr. Durgaprasad Nanda , Senior Medical Officer

- **DNB PGT**
  1. Dr. Ashok Desai
  2. Dr. Dhaval Jhakkar
  3. Dr. Imaan Rumani

- **SENIOR RESIDENTS**
  1. Dr. Arpita Shabnam
  2. Dr. Somnath Gupto

- **JUNIOR RESIDENTS**
  1. Dr. Arindam Roy
  2. Dr. Mizan Ahmed

- **OPD -**
  1. New patients - 3483
  2. Follow up patients – 13704

- **IPD -**
  1. Total admission - 776
  2. Male patients - 370
  3. Female patients - 406
  4. Total emergency admissions - 12

- **Surgical -**
  1. Total cases operated - 488
  2. Male patients - 229
  3. Female patients - 259
  4. Emergency surgeries - 14
  5. 30 day mortality - 9
  6. Subsites operated -
     a) Head and neck -138
     b) Gastrointestinal -
        1) Upper G.I.- 39
        2) Lower G.I. - 66
        3) Hepatobiliary - 23
     c) Thoracic - 0
     d) Genitourinary - 29
     e) Breast - 139
     f) Others - 54

- **Academic works -**

A. **Publication from the Department -**

1) Jayanta Chakrabarti, Syamsundar Mandal. Projection of New Cancer Cases in the State of West Bengal, India - 2020: Estimated District wise new cancer cases in West Bengal -

2020, International Journal of Medical and Biomedical Studies, DOI:10.32553/ijmbs, 2019:79.34

2) Sen,S.Bhattacharjee,I.Ghosh,D.B.Thakkar,S.Hajra,P.Dasgupta Normotensive incidental pheochromocytoma: report of a rare case with a brief review of literature, International journal of Endocrinology, DOI 10.22141/2224-0721.15.5.2020.212748 Vol16ed-5,432-437
3) Ray S, Saha D, Alam N, Mitra Mustafi S, Mandal S, Sarkar A, Majumder B, Murmu N. Exposure to chewing tobacco promotes primary oral squamous cell carcinoma and regional lymph node metastasis by alterations of SDF1α/CXCR4 axis. Int J Exp Pathol. 2021 Apr;102(2):80-92. doi: 10.1111/iep.12386. Epub 2021 Mar 3. PMID: 33655604; PMCID: PMC7981595
4) Bhattacharyya S, Ray S, Saha D, Mustafi SM, Alam N, Sarkar A, Murmu N. Chewing tobacco may act as a risk factor for dysplastic transformation of squamous cells in Oral leukoplakia- A cytochemistry based approach. Pathol Res Pract. 2021 Feb;218:153287. doi: 10.1016/j.prp.2020.153287. Epub 2020 Dec 24. PMID: 33454586
5) Ghosh P, Alam N, Mandal S, Mustafi SM, Murmu N. Association of mTOR pathway with risk of gastric cancer in male smoker with potential prognostic significance. Mol Biol Rep. 2020 Oct;47(10):7489-7495. doi: 10.1007/s11033-020-05808-6. Epub 2020 Sep 11. PMID: 32918126.
6) Islam S , Dasgupta H, Roy A, Alam N, Mondal GK, Roy choudhury S, Panda CK. Down regulation of Beta – catenin in chemo-tolerant TNBC through changes in profile of receptors and antagonists of WNT pathway : clinical and prognostic implications : Cell oncol (Dordr) .2020 May 19 .doi :10.1007 / s 13402-020-00525-5.

B. **Research projects Running -**

1) Molecular Signaling Mechanism in Head and Neck Carcinoma: Synergistic Effect of Lupeol and Ionizing Radiation at Transcriptional and Post-Transcription Level
2) HGF/cMet and EGFR Signaling in Oral Squamous Cell Carcinoma and Lymph Node Metastasis: Effect of Lupeol on these Signalling Pathways in vitro
3) Study of mTOR and its downstream target molecules in Gastric cancer patients sample; the effect of chemopreventive agents in Gastric carcinoma cell line and In-vivo model
4) The role of Ephrin and HGF/cMet pathway in regulating vasculogenic mimicry in Breast cancer and possible effects of phytochemicals
5) Molecular signalling mechanism in oral cancer: Effect of Lupeol in oral squamous cell carcinoma at transcription and post- transcriptional level
6) Targeting the role of serum acute phase proteins to induce peripheral T-cell tolerance in Breast, Ovary and Colon Carcinoma.
7) Study of autophagy signature as prognostic biomarkers and therapeutic targets in indian breast cancer patient
8) Study of CYP2D6 and ABCB polymorphisms with respect to tamoxifen adjuvant treatment in ER and PR receptor breast cancer patients."
9) Human papilloma virus profile and molecular activation of beta-catenin in triple negative breast carcinoma.

10) Analysis of Wnt ,Hedgehog and Notch stem cell signaling pathways in the development of head and neck squamous carcinoma
11) Analysis of CD44-Hyaluronan pathway in head and neck squamous cell carcinoma
12) Non-coding RNA aided immunotherapeutics for Epstien- barr virus associated cancers.
13) Understanding the role of T cells in regulation of cancer stem cells in human breast cancer.
14) RGS5: An emerging molecule in breast tumor progression.

Department of Pain and Palliative Care

Head of the Department

Dr. Ranajit Kumar Mandal, MD, DNB, PGDHHM

Associate Professor [Specialist Grade I(SAG)]

Team

Faculty

Dr. DebasishJatua MBBS,FPM,CCPPM	Senior Medical Officer & In Charge Department Of Pain & Palliative Care,CNCI

Junior Residents
Dr Manglik Das
Dr Puja Mahato
Nursing Staff
S/N Moushumi
Chowdhury (Chakraborty)
S/N Soma Das(Jana)

Objectives of the department

Palliative care improves the quality of life of patients and families who face life-threatening illness, by providing pain and symptom relief, spiritual and psychosocial support to from diagnosis to the end of life and bereavement. Palliative care:

1.Provides relief from pain and other distressing symptoms.

2.Affirms life and regards dying as a normal process.

3.Intends neither to hasten or postpone death.

4.Integrates the psychological and spiritual aspects of patient care.

5.Offers a support system to help patients live as actively as possible until death.

6. Offers a support system to help the family cope with the patient's illness.

7. Uses a team approach to address the needs of patients and their families, including bereavement counseling, if indicated.

8. Will enhance quality of life, and may also positively influence the course of illness

9.Is applicable early in the course of illness, in conjunction with other therapies that are intended to prolong life, such as chemotherapy or radiation therapy, and includes those investigations needed to better understand and manage distressing clinical complications.

The patients experience pain often at presentation, sometimes during treatment and even during post treatments follow up as a sequential result of the treatment or as a result of treatment failure rather with the further progress of the disease. The efficient and judicious management of pain at any stage thus helps to reduce the pain and improves the QOL of the sufferer. With a well designed target, the functioning of this Department is continued with the regular supply and

distribution of Morphine tablets at free of cost and with all the supportive care (wound care, lymphedema care, psychosocial counseling, Telephonic support and home based care with Bereavement counselling) as applicable in individual patients at this Institute.

Brief description of the work done

The Departmental OPD functions thrice in a week, on Mondays, Wednesdays and Saturdays and also in the other working days of a week in need.The Department handles all referred indoor cases as and when requested from other Departments both in OPDs & in wards. A total number of **550** patients have been **newly registered** in the Department during the period between April' 2020 and March' 2021.The Department also have treated **946** of **old/follow** up patients during the year. Total number of patients during the year is **1496 among which 29 patients were** referred from other Institutions (like TMH Mumbai, TMC Kolkata, CMC Vellore, ESI Hospital, Kolkata) .

The number of new patients attending this Department is gradually increasing over the years. Approximately **72,199** tablets(1.12KG) of Morphine [10 mg (SR & IR) & 30 mg-SR] have been supplied to the patients of this Institute during the last one year to meet the challenge of pain management effectively and adequately even during the COVID pandemics. Around **139** Fentanyl patches (25mcg and 50 mcg) and 48 Buprenorphine patches (10mcg) are also distributed to the needy patients free of cost

Psychosocial Counseling, Diet Counselling and General physiotherapy was offered to**386, 20 and 12 patients** respectively.

Distribution of Total cases:
Total Number of Patients seen = 1496

Total Number of Female Patients seen = 737

Total Number of Male Patients seen = 759

Disease Site	**Total cases**
Head & Neck	699
Thorax(Lungs, Breast)	144
Upper Abdomen(Stomach, GB, Liver, Pancreas, Esophagus)	201
Lower Abdomen(Rectum ,Bladder, Prostate, Colon)	65
Gynecological Malignancies	240
Other(Perineum	96

/Bone/STS/Lymphomas)l sites	
Misc. malignancies	51
Total	1496

Ruma Abedona Hospice, a city based NGO has started functioning in this institute since June'13.This NGO helps the patients of this hospital and their care givers with careful and effective counseling as and when required. With the help of this NGO , we have started with home based Palliative care services to the needy and deserving patients free of cost. This organization offers healthy dressings of the wounds of the patients under care of the Palliative care unit effectively under close supervision of the doctors.

The total home based Palliative care services provided to the needy and deserving patients free of cost are **37** including **Bereavement care for 21 families** from the period of April 2020 to March 2021 around Kolkata and adjacent area, Hoogly. Approximately **15** patients received **Lymphedema Care**& 232 patients were provided comprehensive Wound care between April' 2020 and March' 2021.

We are getting the active support of this NGO at this institute OPD twice in a week as a routine. They are also providing the medicines to the poor patients free of cost. Around **83** patients were benefitted from such initiative. Thus improving the QOL of the patients concerned.

Seminars/Workshops:

Dr Debasish Jatua was invited as Speaker/Faculty in a live **WEBINAR on 'PALLIATIVE CARE IN ONCOLOGY' Chaired by Padmashree Dr MR Rajagopal** organized by the **ESI Institute of Pain Management** on 5th July 2020 to give a lecture On **'Ethical Dilemmas Faced During Covid 19 Pandemic Situation'**

Dr Debasish Jatua also Moderated the session on **'CANCER PAIN'** along with Dr Amna Goswami at the **International Conference by West Bengal Society for the Study of Pain (online)(WBSSPCON 21**)organized by Daradia Pain Hospital & WBSSP on 16th January,2021

Academics:

Dr Debasish Jatua gave lecture as Guest Faculty at ESI Institute of Pain Management (under WBUHS) on various aspects of Pain Management & Palliative Medicine after proper permission from Competent Authority of CNCI.

Training of Trainee nurses(from other Institute) & PhD fellows of CNCI about BASICS OF PALLIATIVE CARE is continued as before.

Clinical Rotation in Pain and Palliative care department of CNCI for fellows from ESI Institute of Pain Management under the aegis of the West Bengal University of Heath Sciences is continued in the Department.

Dr Debasish Jatua is continuing as Fellow in the course National Fellowship in Palliative

Medicine conducted by Institute of Palliative Medicine, Kozhikode, Kerala, India (WHO Collaboration Centre for Community Participation in Palliative Care and Long Term Care) with Christian Medical Association, India to enrich his knowledge further in Palliative Medicine for providing optimum care to the patients of CNCI.

Name of the department: MEDICAL RECORDS UNIT

In-Charge of the department:

Name	Designation
SANMOY CHAKRABORTY	ALIO

Other staffs of the department

Name	Designation
Harihar Nayak	GDA

CNCI, being one of the regional cancer centers of Eastern India, the number of cancer patients visiting the hospital is increasing each day which has a proportional effect on the number of records stored in the Medical Record Department. Also, CNCI receives frequent requests for medical records from various researchers working in the field of cancer research in this institute. Moreover, medical records of cancer patients are unique in nature as compared to medical records of the patients of general hospitals, due to the fact that the history of previous treatments are very useful at the time of subsequent follow-ups or in case of second line treatment for recurrence of cancers and occurrence of cancer in any other primary site, which may occur due to curative treatment of the patient's previous cancer. The medical records of the patients are required to be kept till the natural death, or death due to cancer of the patients. Moreover, even after the death of the patients, records are required for the research purposes. On the contrary, most of the medical records of the patients of general hospitals are required to be kept for few days or months. Only thus, in view of treatment and cancer research, it is necessary to computerize the medical records of cancer patients. Meticulous medical record keeping directly helps in bio-statistics of National Cancer Registration not only in India but also in the world.

Objectives of the department

1. To maintain the medical records of the patients who come for their treatments to the hospital of this institute.
2. To provide medical records of the patients to the departments related to patients' services and research.
3. Enhance public service and cut down on time lags due to want of physical documents.
4. Ensure security and confidentiality of documents.
5. Helping better research work for Scientists and better treatment for Doctors.
6. Minimizing turn-around time for key departmental processes.
7. Improves the ability to meet public request on real time basis.
8. It is an official record which digitalizes the health information for improving efficiency, quality of care and it definitely reduces the costs.

Brief description of the work done related to the patient-services provided by the Medical Records Unit during the year are as follows:-

Aid in Medical Education and Research

Approximately 4850 Medical Case Records (Case Sheets) have been retrieved and issued to Researchers, Doctors authorized by the concerned Consultants for research, education and other official purposes.

Computerization and Digitization of Medical Records

- Digitization of in-patient medical records of hospital was started from 2012 for easy retrieval of records. Over one lakh of case records of patients have been scanned for future reference.
- The Medical Records department implemented Hospital Information Management System and Automated Medical Record Keeping System.
- The Medical Records department provided the photocopy services to the patients.
- Total 6524 number of new cancer patients registered for treatment during April 2020 to March 2021.
- Total 3896 number of cancer patients admitted for treatment during 2020-2021.
- Total 42389 number of new & old cases attended at OPD during 2020-2021.
- Total 75 number of hospital deaths during 2020-2021.

Division of Preventive Oncology

Head
Dr. Ranajit Kumar Mandal
Specialist Grade-I

Work done

Preventive Oncology Services at The Ruplal Nandy Memorial Cancer Research Centre (RNMCRC), Chandannagar, Hooghly, has been temporarily suspended during the year 2020-21 due to major civil work. However, Preventive Oncology services were rendered from Gynecological Oncology of CNCI, Kolkata campus and the relevant report has been given in report of the said department.

It has been decided by the CNCI authority to start a 15 bedded Hospice Centre where terminally ill cancer patients will be accommodated. Accordingly all arrangements have been initiated, but because of the Covid pandemic the facility could not be started.

The RNMCRC, Chandannagar facility has been utilized by the Sub-Divisional Officer, Chandannagar Sub-Division, to render the Safe Home services for the Covid infected patients. As many as 40 beds were utilized for the purpose. Some of the pictures of the Safe Home facility are given below.

Patient Care Facilities

Diagnostic facilities

A. Pathological Laboratory facilities

1. Clinical Biochemistry with Auto-Analyzer
2. Cytology & Histopathology Section

B. Radiological facilities

1. X-ray – Three units, one for general radiography, one for fluoroscopy and special procedures and one mobile X-ray at ITU.
2. Computerisd Radiography system with laser camera for digital films.
3. Ultrasonography- Two units: one B & W, one colour Doppler.
4. Mammography unit (analogue model).
5. Guided (USG) interventions such as FNAC, biopsy, drainage.
6. Review reporting of imaging (CT/MRI) done outside.
7. CT SCAN with CT Simulator

C. Other diagnostic facilities

1. Pulmonary Function Test
2. Colposcopy

D. Blood Bank

Therapeutic facilities

A. Surgical facilities

1. Gastrointestinal & Genitourinary surgeries
2. Breast cancer surgeries
3. Surgery for various peripheral soft tissue sarcomas
4. Lobectomy for lung cancers
5. Head and neck surgeries
6. Gynaecological oncological surgeries

B. Radiotherapy facilities

1. Dual Energy Linear accelerator (ELEKTA Synergy) with electron beam treatment facility
2. 16 slice CT simulator
3. Ir-192 HDR after-loading brachytherapy machine (Integrated brachytherapy unit).
4. Besides these, there are two bunkers ready and acquisition of one low energy Linear

accelerator and one Telecobalt machine is under process.

5. Treatment Planning Systems TPS (CMS-XIO, Monaco, Oncentra), dosimeters and calibration instruments like Unidos E electrometers, 3-D RFA water phantom (MP3-M, PTW), fluence analysis dosimetry system (2D array), Film dosimetry system etc.
6. 3D Conformal Treatment with Multileaf Collimator (MLC), Intensity Modulated Radiation Therapy (IMRT), Image Guided Radiation Therapy (IGRT), Volumetric Modulated Arc Therapy (VMAT) and SBRT treatments.

C. Chemotherapy facilities

1. Day Care and Indoor Chemotherapy services
2. Paediatric Oncology Section

Other facilities

1. Palliative Care services for pain relief.
2. 'Ruma Abedona Hospice', a city based NGO, helps the patients of this hospital and their care givers with careful and effective counseling as and when required.
3. Early detection and screening camps
4. Evening pay clinic

Government schemes

1. Empanelment of CNCI in Swasthya Sathi (state sponsored medical insurance scheme) for all modalities of Cancer treatment as an "A" category hospital.
2. Rashtriya Arogya Nidhi (RAN) fund to provide free chemotherapy for patients with BPL status.

RESEARCH WING

Department of Anticancer Drug Development and Chemotherapy

Head of the department / In-Charge: Madhumita Roy, Ph.D.

Team

Name:	**Designation:**
Dr. Supratim Ghosh	**Senior Scientific Officer (Gr. II)**
Ms. Upasana Das	ICMR-Senior Research Fellow
Ms. Oyendrila Ghosh	CSIR-Junior Research Fellow
Mr. Sougata Mondal	CSIR-Junior Research Fellow
Ms. Bidisha Maiti	UGC-Junior Research Fellow
Other Team Members	
Mrs. Rina Bose	General Duty Attendant

Objectives of the department:

Our current research interest in the Department of Anti-Cancer Drug Development & Chemotherapy (ACDD/C) is focused on the natural product based therapeutics for advanced cancer treatment. As mentioned in the previous year report, we are expanding our research towards the field of novel organo-metallic complexes for progressive cancer therapy. In ancient Ayurvedic system, divalent metal ions have been used in clinics for several years to treat hematological disorders. These metals primarily include mercury and copper. From the efficacy of the treatment outcome, it was concluded that these divalent metal ions can play major role in bone marrow differentiation. However, most of the ayurvedic formulations of these metal ions were insoluble in water. Therefore, oral intake was the only route of administration for systemic adsorption. Prolonged use of these heavy metals at higher dose caused chronic toxicity, due to accumulation in the digestive tract. Even with these limitations, their treatment outcome was impressive. Considering the therapeutic role of these metal ions, we have developed a mercury-containing organo-metallic complex for leukemia treatment.

In the past, metal based compounds were widely used in the treatment of various diseases including arthritis, leishmaniasis, syphilis as well as malignant tumors. However, the lack of clear distinction between their therapeutic and toxic doses was a major challenge for the wide-spread use of these compounds/complexes. With the discovery of cisplatin by Barnett Rosenberg in 1960s, a milestone in the history of metal-based drug was established. Platinum drugs, such as cisplatin, carboplatin and oxaliplatin are the foundation of the metal-based compounds in the treatment of cancer. Following the activity of these drugs we believe, other metal based compounds / complexes could also contribute significantly in the field of cancer therapy. In addition to the mercury based organo-metallic complex, we have also developed a molybdenum based complex for the treatment of epithelial malignancies. The biophysical characterization and investigation of anti-cancer activity of these complexes are under progress. An Indian patent for the mercury based complex is filed **(Application no. 201931006856; Feb, 2020)** along with a provisional Indian patent for the molybdenum based complex

(Application no. 201931006875; Feb, 2019). Recently, we also started working on the formulation of a novel vanadium containing organo-metallic complex. Details are mentioned below.

Brief description of the work done during the year:

Since 2019, our primary research focus is to develop natural product based organo- metallic complexes for advanced cancer therapy. The efficient outcomes of the treatment procedures utilizing divalent metal ions (Hg^{2+}, Cu^{2+}), evidently reported their beneficial role in bone marrow differentiation[7]. Based on these findings, we have developed a novel mercury containing organo-metallic complex for leukemia treatment. As mentioned in the last year report, the molecular weight of the synthesized complex was ~650 Da, while the mercury content is ~30% (w/w). Therefore, mercury exposure should be within the range of WHO guideline (25.0 µg/Kg body weight per day) in case of clinical application of the complex, up-to 80.0 µg/kg body weight per day. Our synthesized organo-metallic complex is completely water soluble. Therefore, it could be easily delivered to blood stream via intravenous injection. This strategy should help to avoid accumulation of mercury at the digestive system when administered orally in large amount.

The complex was synthesized by reacting aqueous solution of mercury chloride with the ethanolic solution of curcumin at alkaline pH. The resulting complex got precipitated in alcohol and further solubilized in 10 mM NaOH aqueous solution. The UV-visible spectrum of the complex showed four distinct bands (**Figure 1a**) at ~215, ~250, 300 and ~400 nm. The typical peak of curcumin at ~425 nm was missing in the complex. This was most likely because of change in the characteristic electronic configuration of curcumin, due to metal binding. The ^{1}H NMR spectra in **figure 1b** showed the peaks for the methoxy ($-OCH_3$) and phenolic hydroxyl (-OH) group of curcumin at 3.78 and 9.4 ppm, respectively. Conjugated peaks at the regions of 6.61–6.95 and 7.33–7.5 ppm are assigned to the aromatic ring protons and heptadienedione chain protons, respectively. All proton NMR spectra were obtained by dissolving the complex in deuterium oxide. The predicted structure of the mercury based organo-metallic complex is displayed in the **figure 1c**, with numbers assigned for each atom.

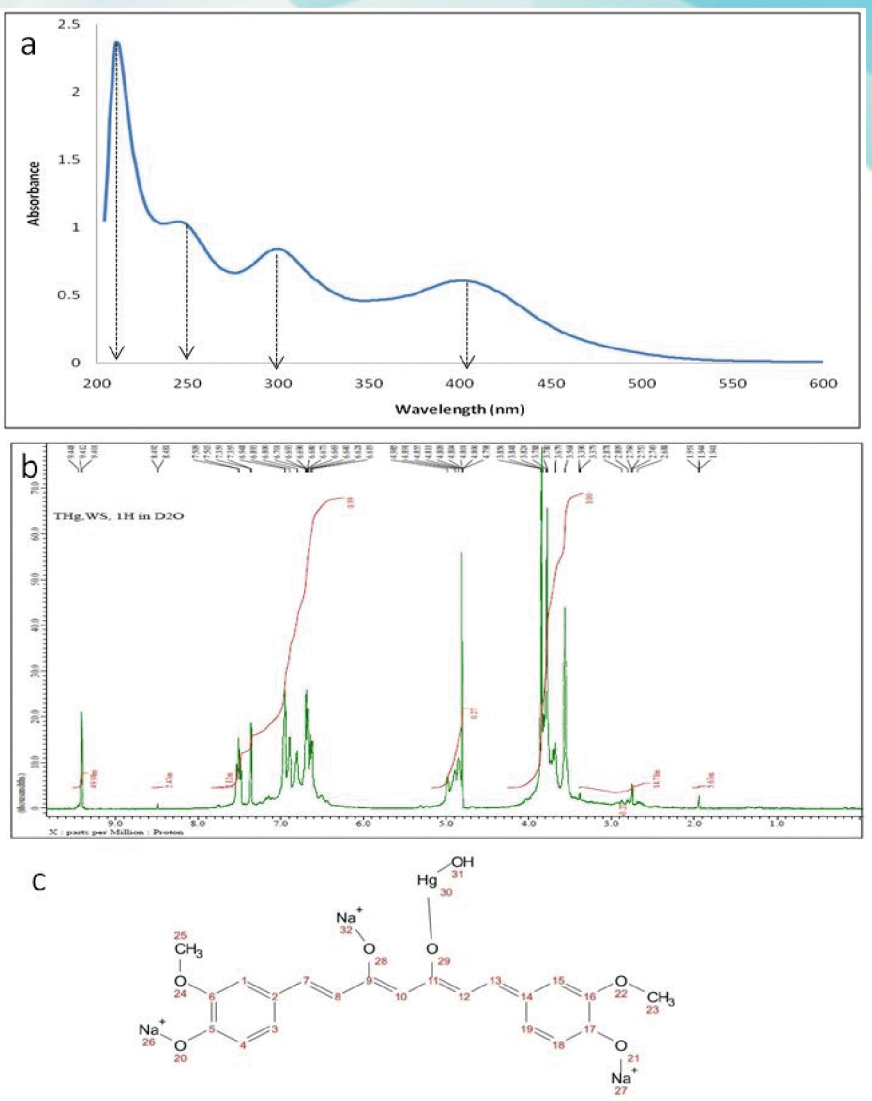


Figure 1:a.UV-visible spectrum of the synthesized mercury based organo-metallic complex showing four distinct peaks at ~215, ~250, 300 and ~400 nm. b. Proton (1H) NMR spectrum of the mercury containing organo-metallic complex after water suppression. Characteristic peaks for methoxy (-OCH3) and phenolic hydroxyl (-OH) groups at 3.78 and 9.4 ppm are observed, respectively. Conjugated peaks in the regions of 6.6 1–6.95 and 7.33 – 7.5 are assigned to the aromatic ring protons and ethylene bridge protons. c. Schematic diagram showing predicted structure of the complex. Calculated molecular weight of this complex is ~650 Dalton.

To evaluate the *in vitro* anti-cancer activity of the complex we have performed cell viability assay on Acute Lymphocytic Leukemia (ALL) cells, Molt-4 and Acute Myeloid Leukemia (AML) cells, HL-60. As positive control, we also used cytarabine under similar parameters. 10 mM NaOH solution was used as vehicle control. For no treatment group, complete media was added instead of the drug/s. Cell viability assay was performed using MTT read outs and results are exhibited in **figure 2**. Our preliminary data demonstrated that the proposed complex has dose dependent cytotoxic activity against both ALL and AML cell lines. Almost 50% of the Molt-4 cells were killed at the concentration ~10 μM in case of the complex treatment

(**Figure 2a**); on the other hand, similar percentage of cell killing was achieved at a concentration 11.6 µM in case of HL-60 cells (**Figure 2b**). The IC50 of cytarabine in Molt-4 and HL-60 is 10 nM and 400 nM, respectively. Though it shows greater cytotoxicity on leukemia cells, the chronic use of cytarabine can cause severe cerebral & cerebellar dysfunction, ocular toxicity, pulmonary toxicity and gastro-intestinal ulceration. We demonstrated that mercury complex has significantly increased cytotoxicity towards Molt-4 cells comparing to normal epithelial cells, HEK-293, while previously published research works reported that cytarabine eliminates leukemic cells as well as normal epithelial cells indiscriminately. Hence we believe, our synthesized complex could be a potential candidate for the treatment of acute leukemia cases, reducing collateral toxicity. We have already filed Indian patent. In the upcoming years, we further aim to investigate the mechanism of action *in vitro* as well as anti-cancer activity, *in vivo,* including its biodistribution and systemic toxicity. We are also planning to investigate the therapeutic activity as well as toxicity of the complex, *ex vivo*, on human blood cells.

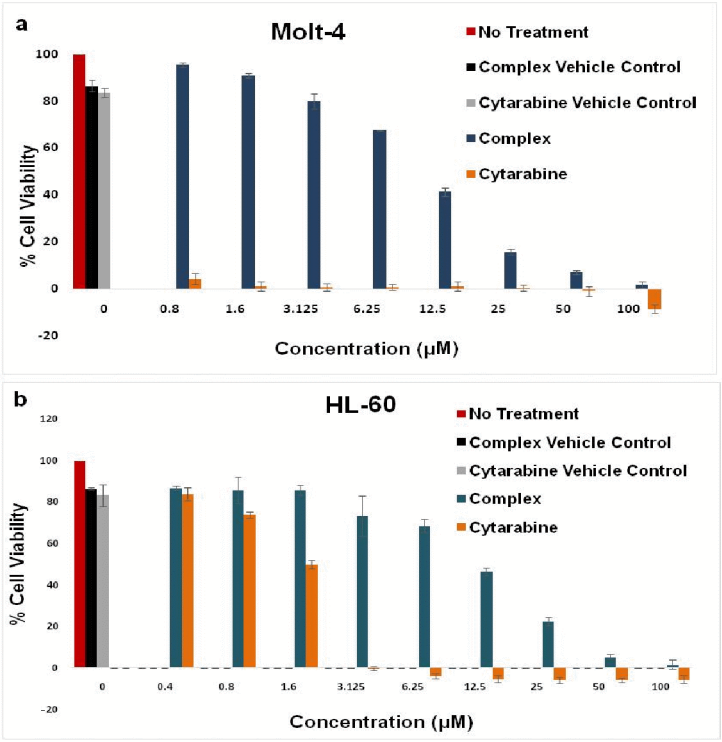


Figure 2: Graphical representations showing cell viability assay results of the complex along with cytarabine in a. Molt-4 and b. HL-60 cells. The complex showed dose dependent cytotoxicity in both cell lines. 50% cell killing was achieved at concentration 10 and 11.6 µM in Molt-4 and HL-60, respectively. Data are represented as mean ± SEM, n=3.

We are also trying to develop a novel vanadium based organo-metallic complex for the treatment of epithelial malignancy. The biophysical characterization of the complex was performed using UV-visible and fluorescence spectroscopy. The UV-visible spectrum of this complex (**Figure 3a**) showed two distinct peaks at ~250 and ~350 nm, along with the characteristic peak of curcumin at 425 nm. The ethanolic solution of curcumin separated into three distinct bands on silica gel TLC (Thin layer chromatography) plate in a solvent system of Chloroform: n-Hexane: ethyl acetate= 6:3:1 (**Figure 3b**). The complex also showed three bands. However, the R_f values of the bands in the synthesized complex significantly reduced in compare to curcumin, indicating increased polarity of the complex. The organo-metallic complex formation

was further confirmed by fluorescence spectroscopy upon excitation at 425 nm (**Figure 3b**). Prominent emission band at 530 nm was only observed in case of curcumin. This band was quenched in case of the complex due to metal binding.

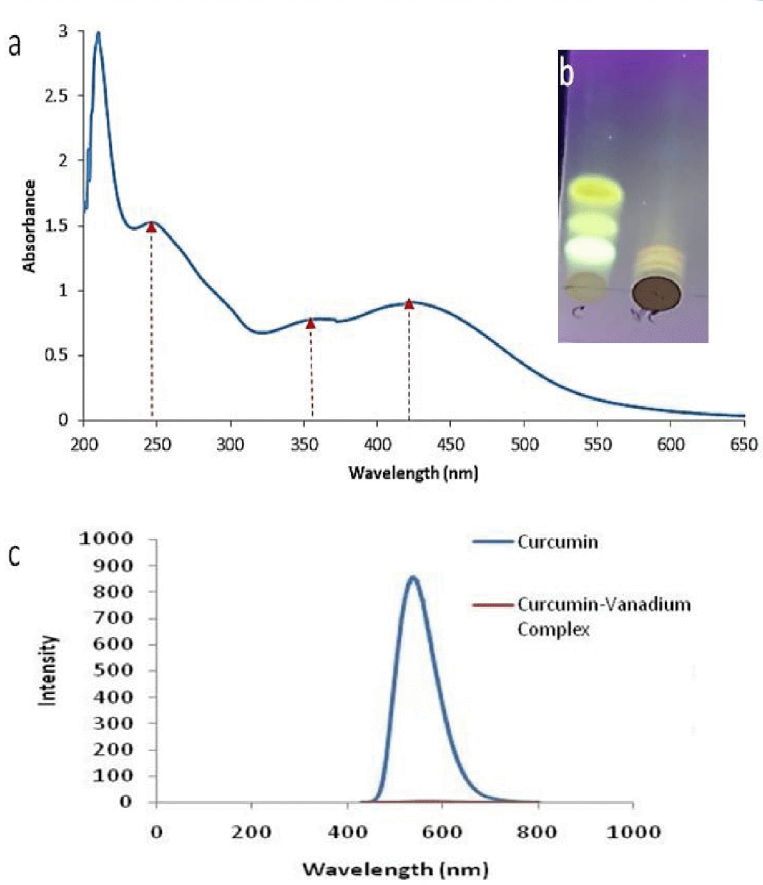


Figure 3: a. UV-visible spectrum of the synthesized vanadium based organo-metallic complex showing three distinct peaks at 250, 350 and 425 nm. b. Pictorial representation of silica gel TLC plate with solvent system Chloroform: n-Hexane: ethyl acetate= 6:3:1, showing discrete bands. Reduction in the retention factor in case of the complex clearly indicates that the synthesized complex/es are more polar than the organic moiety (curcumin). c. Fluorescence spectra of curcumin and the complex showed that the characteristic emission of curcumin at 530 nm was quenched due to complex formation.

Figure 4 depicts the ^{1}H NMR spectrum of the vanadium complex. The spectrum showed characteristic peaks for methylene ($-CH_2$), methoxy ($-OCH_3$) and hydroxyl (-OH) groups at 1.2, 3.6 and 4.7 ppm. Conjugated peaks in the region of 6.5–7.5 ppm indicated the aromatic ring protons. All proton NMR spectra were obtained by dissolving the complex in deuterium oxide. The predicted structure of the complex is exhibited in the **figure 4 inset**, with numbers assigned for each of the atoms.

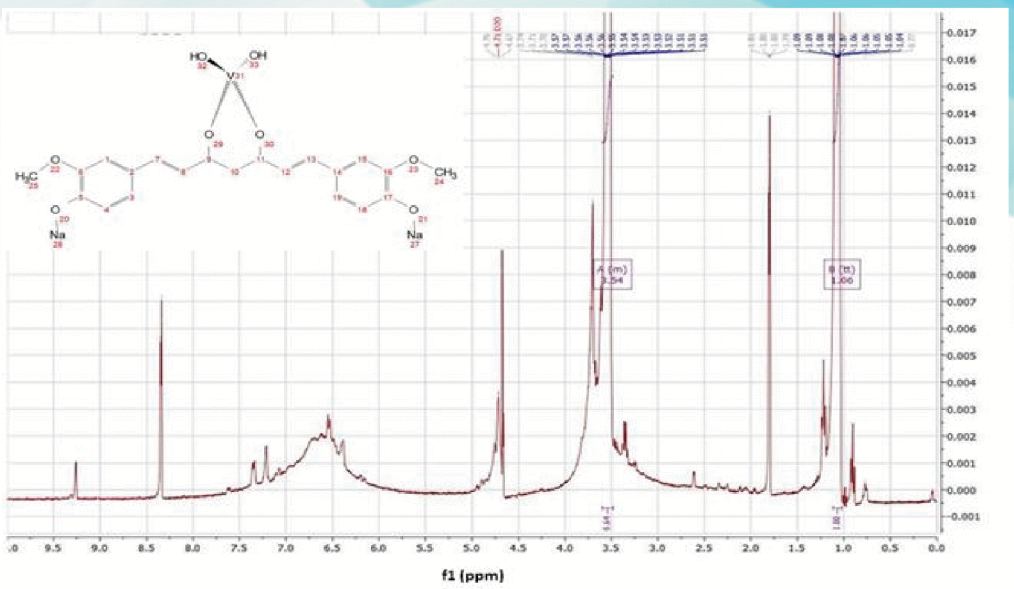


Figure 4: Proton (^{1}H) NMR spectrum of the vanadium complex with water suppression. Characteristic peaks for methylene (-CH_2), methoxy (-OCH_3) and hydroxyl (-OH) groups at 1.2, 3.6 and 4.7 ppm are observed, respectively. Conjugated peaks in the region of 6.5–7.5 ppm area assigned to the aromatic ring protons. Predicted structure of curcumin-vanadium complex is shown in the inset. Calculated molecular weight of this complex is ~454 Dalton.

The *in vitro* cytotoxic activity of the vanadium complex was evaluated by cell viability assay on human breast cancer cell line, MDA-MB-231. Results showed dose dependent cytotoxicity of the complex (**Figure 5**). Almost 56% cells were killed in case of the highest concentration, 100 µM. The vanadium complex exhibited moderate anti-cancer activity against MDA-MB-231 cells. In near future, we are planning to synthesize different derivatives of the organo-vanadium complex with enhanced cytotoxic potential and evaluate their activity on malignant epithelial cell lines.

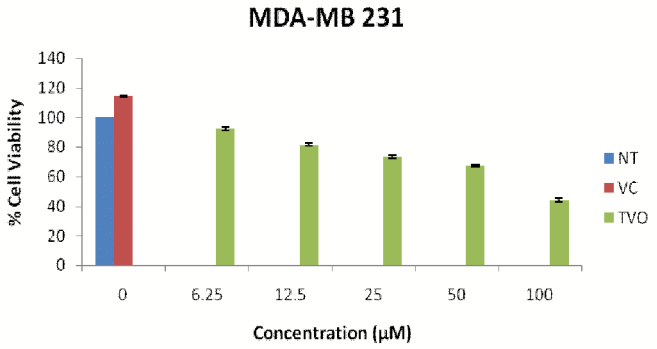


Figure 5: Graphical representation of cell viability assay results depicted dose dependent cytotoxicity of the complex on MDA-MB-231 cell line. 5 mM NaOH solution was used as vehicle control. Results showed 56% cell killing in case of the highest concentration (100 µM). Data are represented as mean ± SEM, n=3.

Projects running (Extramural) –

Dr. Supratim Ghosh

"Development of a novel mercury based organo-metallic complex for acute leukemia treatment" Indian Council of Medical Research (Govt. of India)

A. Projects running (Internal) –

Dr. Supratim Ghosh

"Development of a novel vanadium containing organo-metallic complex for progressive cancer therapy"

B. Students' Projects running –

Ms. Upasana Das

"Investigation of anti-cancer activity of a novel multi-modality nano-conjugate: poly- FdUMP coated gold nano-rod"
Indian Council of Medical Research (Govt. of India)

C. <u>International Publication</u> :

1. Upasana Das, Avishek Bhuniya, Anup K. Roy, William H. Gmeiner, Supratim Ghosh* "Hairpin Oligonucleotide Can Functionalize Gold Nano-Rod for *in vivo* Application Delivering Cytotoxic Nucleotide and Curcumin : A Comprehensive Study in Combination With NIR Laser" ACS Omega 2020, 5, 44, 28463–28474.

A. Other academic activities

a) Students undergoing PhD: Ms. Upasana Das (ICMR-SRF), Ms. Oyendrila Ghosh (CSIR-JRF), Mr. Sougata Mondal (CSIR-JRF), Ms. Bidisha Maiti (UGC-JRF)

b) Interesting observations, if any: We synthesized a novel molybdenum based organo-metallic complex that has a characteristic absorption peak at near IR region. The complex also showed cytotoxic activity against human lung cancer cells, A549. These characters of the complex could be utilized for the treatment of locally advanced epithelial malignancies in selective manner.

Department of Cancer Chemoprevention

Our Team	Designation
Head of the Department: Dr. Prosenjit Saha, M.Sc., Ph.D	Senior Scientific Officer Grade-I
Faculty: Dr. Subhadip Hajra, M.Sc. Ph.D	Senior Scientific Officer Grade-II
Students	
Dr. Arijit Bhowmik	DBT-Research Associate
Mr. Atish Barua	Institutional SRF
Ms. Pritha Choudhury	Institutional SRF
Mr. Souradeep Biswas	ICMR-JRF
Ms. Rituparna Ghosh	Institutional JRF
Ms. Priya Samanta	CSIR-JRF

Objectives of the Department:

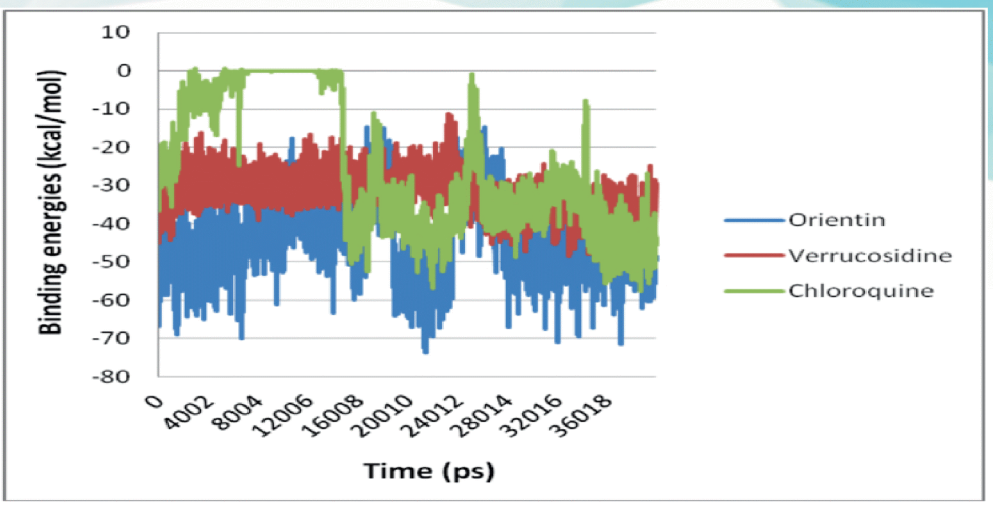
The sole objective of this Department is to prevent the cancer incidence in our society by using natural compounds presence in our foods and beverage. Our investigation highlighted the natural compound namely Eugenol, Rutin, Orientin, Indole-3-Carbinol (I3C) and 3,3′-diindolylmethane (DIM) present in Indian popular foods and beverage which is useful to prevent cancer through modulation of cancer Stem cells. Moreover, during this pandemic situation we switched our focus to COVID-19 and cancer related research.

Brief description of the key finding during the year

Project 1: Role of "Tulsi or Holy Basil" to control COVID-19

The year 2020-21 was a nightmare for whole world because of COVID-19 pandemic. We are pleased to inform that, during lockdown period we performed several *in silico* studies to find out efficacy of natural compounds to combat against COVID-19. Following the recommendations of ICMR and Ministry of Ayush, Government of India, about drinking of herbal tea or decoction (kadha) made from holy basil **Tulsi** we try to explore the active constituent presence in tulsi that could restrict covid-19.

Our studies reviled that **Orientin** is the key compound present Tulsi which is effective against the Covid-19 better than other reported natural compounds or even better than chloroquine, that used to prevent COVID-19 during last year.



India is reeling under the second wave of corona virus with the country recording world's sharpest spike in new COVID-19 cases daily from the past few days because of predominant lineage of B.1.617. The WHO has described it as a "variant of interest", suggesting it may have mutations that would make the virus more transmissible and cause more severe disease or evade vaccine immunity. Our *in silico* studies reviled that Orientin could be fight against this mutant form of COVID-19 successfully (data not published yet).

Project 2: Role of indole based natural compound 3,3′-diindolylmethane (DIM) during adjuvant therapy with doxorubicin (DOX) in triple negative breast cancer

Combined therapy with multiple drugs is a common practice in the management of cancer, which can accomplish improved therapeutic benefits than a single drug, and can diminish the side effects and drug resistance. Doxorubicin (DOX) is an anthracycline antibiotic widely used in the treatment of various types of human malignancies including leukemias, lymphomas, solid tumors, soft-tissue sarcomas and breast carcinoma. However, its clinical use is limited due to dose-dependent cardiotoxicity and genotoxicity which may considerably impact patient health and quality of life. Other than DOX mediated toxicity, resistance of breast cancer stem cells (BCSCs) towards DOX therapy is another challenge for researchers. As it is known that natural compound DIM has ROS scavenging activity, it is intriguing to study the combinatorial effect of DIM and DOX not only breast cancer cells, but also on DOX resistant cancer stem cells by using tumorosphere generation, flow cytometry analysis, cell survivability assay, western blot analysis etc. Results showed that DIM alone or in combination with DOX suppressed cell migration and colony formation against two breast cancer cell lines MCF-7 and MDA-MB-231. On the other hand DIM and DOX showed inhibitory effect on sphere forming ability and CSC enrichment against triple negative breast cancer cell lines. From these results it is evident that DIM and DOX in combination is more efficacious than monotherapy and DIM may serve as a promising adjuvant in breast cancer chemotherapy.

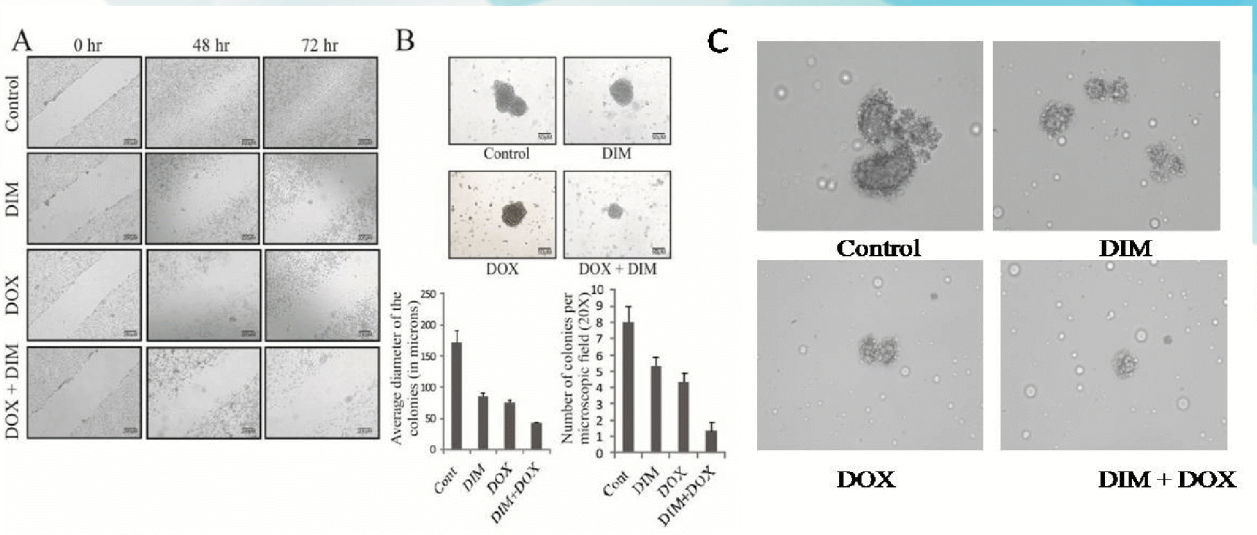


Fig: Suppression of cell migration, colony formation and Reduction of CSC population in triple negative breast cancer derived tumorospheres by DIM alone or in combination with DOX.

Project 3: Effect of Orientin and 5FU treated CSC-spent media on angiogenesis

To find out the effect of CSCs combinatoroially treated with Orientin and 5FU on angiogenic model system, a chick chorioallantoic membrane (CAM) assay was performed. Results showed that after 4 days of implantation, collagen onplants with the conditioned media (CM) (spent media) of 5FU treated CSC enriched spheres (CES) of HCT116 significantly increased blood vessel densities on the CAM surface in comparison to that from CM of untreated CES & CM of Orientin treated CES. Maximum reduction in blood vessel formation was noticed due to the introduction of CM of Orientin+5FU treated CES on the CAM surface. These *in vivo* results not only validated the differential pro-angiogenic potentials of CSC enriched spheres of colorectal cancer, but also confirmed the high anti-angiogenic potential of Orientin and 5FU combination. Taken together, our findings illustrate that 5FU increases angiogenic potential which can be regulated by the combinatorial treatment of Orientin and 5FU.

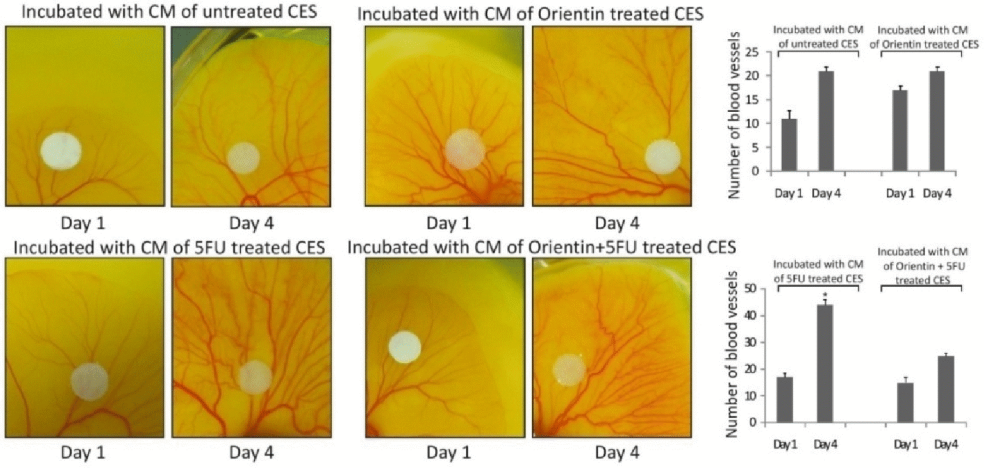


Fig: Figure representing photomicrographs of chick chorioallantoic membrane (CAM) assay depicting angiogenic potential of the collagen onplants with CM of 50 µM 5FU, 10 µM Orientin and both 5 µM 5FU & 1µM Orientin treated CES, after 4 days of implantation.

Project 4: Evaluation of the chemotherapeutic efficacy of Rutin during metastasis by targeting EMT and anoikis

In our experiments we find that Rutin can effectively induce apoptosis in metastatic breast cancer cell line 4T1 and MDAMB-231. *Invitro* dose of Rutin is determined by MTT assay, which is 46.18 µm for 4T1 and 145 µmfor MDAMB-231. *Invitro* cytochrome-c release assay as well as flowcytometric analysis shows that rutin more effectively induce apoptosis in combination therapy with paclitaxel than monotherapy of paclitaxel, which suggest that rutin can be used in combination therapy with paclitaxel for metastatic breast cancer treatment. *In vivo* LD50dose of Rutin is found to be more than 2000 mg/kg b.w (determined by up and down method of OECD guideline-425) and effective dose is found to be 20 mg/kg b.w on the basis of examining various haematological parameters, immunological cell parameters and serum parameters.

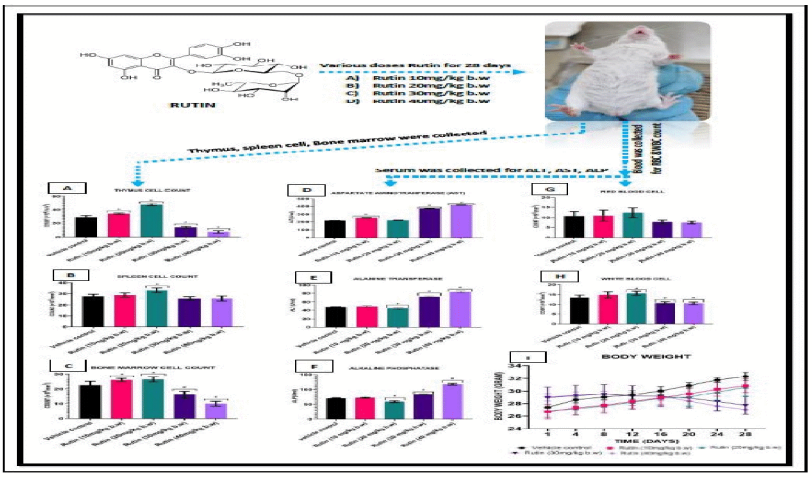


Fig: Effect of rutin and paclitaxel on haematological and immunological parameters of Balb/c mice.

Projects running (Extramural funding) –

- P.I.: Dr. Prosenjit Saha

  Project Title: A Way to Overcome Chemo-Resistance in Colorectal Cancer Stem Cells: Therapeutic Targeting By Natural Falvonoid Orientin.
  Funding agency: Dept. of Biotechnology (DBT)

- P.I: Dr. Prosenjit Saha

  Project Title: Evaluation of chemotherapeutic efficacy of rutin during metastasis by targeting EMT and Anoikis
  Funding agency: Indian Council of Medical Research (ICMR)

- P.I.: Dr. Subhadip Hajra
  Project Title: Regulation of crosstalk between EMT pathways and pathways maintaining anoikis resistant CSCs in triple negative breast cancer by exosome mediated co-delivery of 3,3'-diindolylmethane (DIM) and doxorubicin (DOX).
  Funding agency: Science and Engineering Research Board (SERB)

Projects running (Internal funding) –

- P.I.: Dr. Prosenjit Saha

  Role of "Tulsi or Holy Basil" to control COVID-19

- P.I.: Dr. Prosenjit Saha

  Project Title: Alteration of cancer stem cell self-renewal pathway by xanthone from ancient medicinal plant *Swertia Chirata.*

- P.I.: Dr. Prosenjit Saha

  Project Title: Prevention of Lung cancer by eugenol and its effect on modulation of Cancer Stem Cell.

- P.I.: Dr. Subhadip Hajra
  Project Title: Evaluation of chemopreventive and therapeutic efficacy of naturally occurring phytochemicals by targeting stem cell self renewal pathways *in vivo* and *in vitro* experimental models.

Publications:

- Barua A, Choudhury P, Mandal S, Panda CK, Saha P. 2020. Therapeutic potential of xanthones from *Swertia chirata* in breast cancer cells. Indian J Med Res. 152(3):285-295.
- Barua A, Choudhury P, Mandal S, Panda CK, Saha P. 2020. Anti-metastatic potential of a novel xanthone sourced by *Swertia chirata* against *in vivo* and *in vitro* breast adenocarcinoma frameworks. Asian Pac J Cancer Prev. 21(10):2865-2875.
- Barua A, Choudhury P, Panda CK, Saha P. 2020. Chemotherapeutic potential of novel xanthone sourced from *Swertia chirata* against skin carcinogenesis. Asian J. Pharmaceuti. Clinic. Res. 13(12): 84-88.
- Choudhury P, Barua A, Roy A, Pattanayak R, Bhattacharyya M, Saha P. 2021. Eugenol emerges as an elixir by targeting β-catenin, the central cancer stem cell regulator in lung carcinogenesis: an *in vivo* and *in vitro* rationale. Food Funct. 12(3):1063-1078.
- Bhowmik A, Biswas S, Hajra S, Saha P. 2021. In silico validation of potent phytochemical orientin as inhibitor of SARS-CoV-2 spike and host cell receptor GRP78 binding. Heliyon. 7(1):e05923.

Other academic activities:

Paper presented (Oral/Poster):

- Mr. Atish Barua presented a paper entitled "TMX-a novel xanthone sourced from Swertia chirata restricts the process of carcinogenesis by targeting β-catenin, one of the main regulators of Cancer Stem Cell (CSC)" in 10th APOCP General Assembly and Conferences (virtual mode). November, 2020, Tehran, Iran.
- Miss. Pritha Choudhury presented a paper entitled "Eugenol, the elixir of lung carcinogenesis model by targeting β-catenin the central Cancer Stem Cell regulator- an in vivo and in vitro experimental validation" in 10th APOCP General Assembly and Conferences (virtual mode). November, 2020, Tehran, Iran.

- Mr. Atish Barua presented a paper entitled "Evaluation of the possible mechanism of chemotherapeutic potential of anthocyanin rich black rice extract against murine adenocarcinoma" in 14th International Symposium on Cancer Prevention and Therapeutics (virtual mode). March 2021, New Delhi, India.
- Dr. Subhadip Hajra attended 40th annual convention of Indian Association for Cancer Research (virtual mode). March 2021, Institute of Life Sciences, Bhubaneswar, India.

Conference / Symposium / Workshop (International / National) attended –

- Mr. Atish Barua attended 10th APOCP General Assembly and Conferences (virtual mode). November, 2020, Tehran, Iran.
- Miss. Pritha Choudhury attended 10th APOCP General Assembly and Conferences (virtual mode). November, 2020, Tehran, Iran.
- Mr. Atish Barua attended 14th International Symposium on Cancer Prevention and Therapeutics (virtual mode). March 2021, New Delhi, India.
- Dr. Subhadip Hajra attended 40th annual convention of Indian Association for Cancer Research (virtual mode). March 2021, Institute of Life Sciences, Bhubaneswar, India.

Name of the department: Clinical and Translational Research

Team

Name	Designation
HoD **Dr. Kalyan Kusum Mukherjee, MBBS, MD, FCCM, ECMO**	Specialist Grade I
Ugir Hossain Sk, M. Sc, PhD	Senior Scientific Officer
Other Team Members	
Mr. Subhabrata Dey	Technical Officer, In-Charge - Technical Facility
Mr. Somnath Chakraborty	Clinical Research Co Ordinator
Mrs. Mili Das	Clinical Research Co Ordinator
Mr. Suryakanta Ray	Phlebotomist
Students	
Debapriya Roy MahaPatra	CNCI-Junior Research Fellow
Susmita Mondal	CSIR- Junior Research Fellow

Objectives of the department: Our objective is to develop highly interdisciplinary research focused on the pre-clinical development of novel organic molecules and therapeutic devices against different types of cancer. The scientist and clinician are doing research together to synthesized novel molecules and their implications against cancer. We are also focusing to developed nano-size polymeric drug delivery system to enhance the therapeutic efficacy of the existing therapeutic drugs. The nanodevices will be based on drug-polymer conjugation with the sustained drug release capacity. Objective is to create a pathway which bridge between scientist and clinician to translate basic research outcome to the clinic for the cancer patient health benefit. The mission of this department is to initiate clinical trials based on the finding on the basic research team. The work will be carried out with biologists and drug discovery scientists for the development of novel targeted cancer therapeutics. Our team is a highly interdisciplinary and efficient researcher consists of organic chemistry and clinician from medical oncology experts.
We are conducting phase I to phase IV clinical trial of both academic and sponsor initiated regulatory trial. We are conducting Good Clinical Practice (GCP) training regularly. We are also trying to develop industry academician liason for newer anti cancer drug development. Aims of the department are as follows:

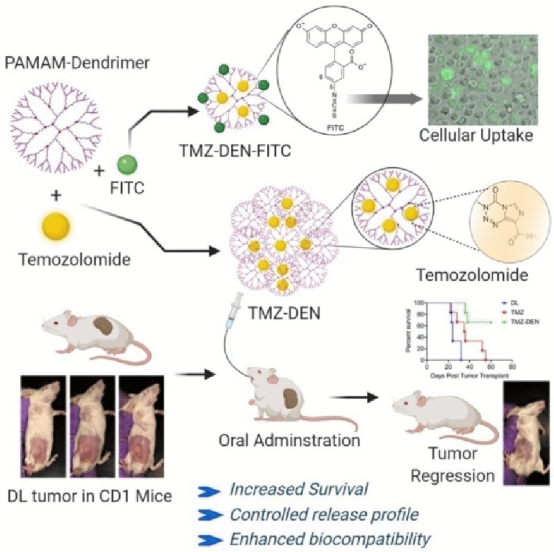
1. Synthesis of novel anticancer molecules
2. Development of the drug delivery nanodevices to enhance drug efficacy and reduced toxicity.
3. Biomarker development
4. New target and molecules identification and study of elaboration of activity
5. Conducting Phase I to Phase IV clinical trial for development of newer anticancer drugs.

The facility of the Department:

The translation research department is well equipped with modern instrument like atomic absorption spectroscopy, LC-Mass Spectrometry (UPLC), Elisa Reader Tecan Austria GmbH, which will be accessible to patient sample analysis, research molecules validation for the release study, and pharmacokinetics. The chemical synthesis instrument rotary evaporator, chillier, the vacuum pump, and chemical fume hood, ultrasonic bath, and magnetic stirrer and vortex are available for the synthesis of small molecules and polymer-drug conjugates. Furthermore, the departments will also aim to undertake a facility for analyzing metabolites in biological samples using mass spectrometry (LCMS). Also to determine the heavy metal concentration in the cancer patient sample for higher research through AAS.

Ongoing Research work (Basic research):

1. Development of a Dendrimer –Temozolomide Sustained release conjugates against Murine Lymphoma: Enhanced was demonstrated using dendrimer-conjugated temozolomide for treating experimental lymphoma, developed as a solid tumor. To enhanced drug localization at the tumor sites with minimal toxicity we have constructed a polyamidoamine (PAMAM) dendrimer conjugated. Our results suggest that the active drug (5-(3-methyltriazen-1-yl) imidazole-4-carboxamide) (MTIC) (derived from temozolomide) showed stable and sustained release from the conjugate, suggesting the suitability of the construct for therapy. Besides growth inhibition and direct killing, the dendrimer–temozolomide construct induced extensive apoptosis not only in parental Dalton lymphoma tumor cells but also in the doxorubicin-resistant form of the tumor cells. The conjugation significantly reduced the solid tumor growth and increased the lifespan with better prognosis, including improved histopathology of the treated mice, while untreated littermates developed extensive metastasis and succumbed to death (https://doi.org/10.1021/acsabm.0c01599). ACS Appl. Bio Mater. 2021, 4, 3, 2628–2638 (**CNCI sponsored**).



2. Synthesis of the novel molecules and their drug delivery system for anticancer activity.

In cancer treatment the main limitation arise due to toxicity and off targeted to the cancer tissues. To solve this thing the welcoming idea is targeted drug delivery approach using small molecule. Due to this reason it is important to synthesis a new molecule attached with a known clinically established drug (either oncologic or repurposing drug) and further design a drug delivery conjugate and diminish toxicity to surrounding, non-pathological tissues. For the development of new chemotherapeutic drugs, DNA is considered to be one of the most important targets. Our main objective is to synthesizing as well as modifying the novel molecules having DNA intercalating properties like naphthalimide moiety, attaching with a known oncologic drug or repurposing drug for improving the antitumor activity, efficacy and safety profile of the novel molecules. As the newly synthesized novel small molecules having low bioavaibility, herein to solve problem the novel small molecules having a known chemical entity attached with polymer that will help to increase bioavaibility, sustained release of the dug from the polymer and lowers the toxicity. Our aim is to synthesis of novel molecules followed by drug delivery system to have the better pharmacokinetics and to have maximum therapeutic efficacy.

We have synthesized series of small novel compound for our study and characterized by 1H-NMR, and EI-MS using LCMS followed by their DNA interaction ability using UV spectrophotometer. The DNA interactive ability was established and biological activity is under process. **(CNCI sponsored).**

2. <u>Natural molecules based drug delivery nanomaterial development:</u> With the objective of low toxic efficient novel drug delivery nanodevise synthesis, natural glycoside based (Stevioside/Rebaudioside-A) have taken as central molecules followed by modification with VPGVG peptide and 5K-PEF molecules. The available hydroxyl function group will be conjugating with anticancer drug molecules. Main goal is to have efficient sustainability therapeutic devices. In the multi steps synthetic process we have completed the PEGylated Rebaudioside-A via trans esterification which were characterize via several characterize method. (**CSIR-EMR-II Sponsored, 2021-2023**).

<u>Extramural Funding support:</u>

1. Principal Investigator: Dr. Ugir Hossain Sk, Project no. 80(0090)/20/EMR-II, Entitled "Development of the natural glycoside (Stevioside/ Rebaudioside-A) based drug delivery nano-probe-carrier for cancer therapeutics" Grant Value: 32 lakhs, Funding agencies: CSIR-EMR-II, Duration Jan. 2021-Dec. 2023.

<u>Ongoing Research work (Clinical Research):</u>

1. A Multicenter, Double-Blind, Randomized, Parallel-Group, Active-Controlled, Two Part, Phase III, Global Study to Evaluate the Pharmacokinetics, Efficacy and Safety of BP 02 (Trastuzumab) in comparison with Herceptin®- EU in Patients with HER2-Positive Early Breast Cancer (EBC) and Metastatic Breast Cancer (MBC)". (Ongoing- Global)

2. A Randomized, Multiple-dose, Multicenter, and Comparative Parallel Study to Evaluate the Efficacy, Safety and Pharmacokinetic Characteristics of Intravenous Infusion of Trastuzumab (Hetero) and Reference Medicinal Product (HERCEPTIN® - Trastuzumab, Genentech, Inc.) in

combination with standard chemotherapy in Patients of HER2-positive Metastatic breast cancer. (Ongoing- Indian)

3. Randomized, Assessor-Blind, Multicentre, Parallel Group, Two Arms, Clinical Study to Assess the Efficacy, Pharmacokinetics, Pharmacodynamics, Immunogenicity and Safety of Rituximab (Test Product, Zydus) in comparison with Rituximab (Reference Product, Roche/Genentech) in Patients with Diffuse Large B Cell Lymphoma (DLBCL). (Ongoing- Indian)

4. A global, multicentre, three arms, open-label randomized study to evaluate the efficacy and safety of Nanosomal Docetaxel Lipid Suspension compared to Taxotere® (Docetaxel Injection Concentrate) in triple-negative breast cancer patients with locally advanced or metastatic breast cancer after failure to prior chemotherapy. (Ongoing- Indian)

5. A Phase 1 Study to Determine Safety, Tolerability, Pharmacokinetics, and Activity of K0706, a Novel Tyrosine Kinase Inhibitor (TKI), in Subjects with Chronic Myeloid Leukemia (CML) or Philadelphia Chromosome Positive Acute Lymphoblastic Leukemia (Ph+ ALL). (Ongoing-Global)

6. A Randomized, Double-blind, Multi-center, Multi-national Trial to Evaluate the Efficacy, Safety, and Immunogenicity of SAIT101 Versus Rituximab as a First-line Immunotherapy Treatment in Patients with Low Tumor Burden Follicular Lymphoma.(Completed- Global)

7. Multicentre, Double-Blind, Randomized, Parallel-Group Study to Assess the Efficacy and Safety of MYL-1402O Compared With Avastin®, in the First -line treatment of Patient with Stage IV Non-Squamous Non-Small Cell Lung Cancer. (Completed-Global)

8. A Multi-Centre, Randomized, Double Blind, Parallel-Group, Comparative Clinical Trial to evaluate the Safety and Clinical Equivalence of Generic Clotrimazole Troche/Lozenges USP, 10mg (Unique Pharmaceutical Laboratories, India) to Clotrimazole Troche/Lozenges ® 10mg (Roxane Laboratories Inc., USA) in subjects with Oropharyngeal Candidiasis". (Ongoing-Global)

Clinical trial:

The clinical data process team is also delivering output through the following project. The project consists of the following manpower:

Dr. Kalyan Kusum Mukherjee (Principal Investigator)
Dr. Suparna Mazumder (Radiologist-Investigator)
Dr. Durga Prasad Nanda (Investigator)
Dr. Shuvam Halder (Investigator)
Dr. Subhadip Das (Investigator)

Publications:

Original Studies:

1 **Kalyan K Mukherjee** , Debasish Banerjee , Anjan Das , Subham Halder , Dattatreya Mukherjee , Shyam Sundar Mondal , Surya Kanta Roy , Mili Das, Chinmay Kumar Panda ,Utpal Choudhury. "Significance of minimal residual disease detection by flow cytometry in Paediatric B cell ALL treatment in tertiary care centre in Eastern India ." **IOSR Journal of Dental and Medical Sciences** (IOSR-JDMS), 19(4), 2020, pp. 11-15, **India**. https://iosrjournals.org/iosr-jdms/papers/Vol19-issue4/Series-2/C1904021115.pdf

2. **Kalyan K Mukherjee** , Debasish Banerjee , Anjan Das , Subham Halder , Dattatreya Mukherjee , Shyam Sundar Mondal , Surya Kanta Roy , Mili Das, Chinmay Kumar Panda Utpal Choudhury. Correlation of Minimal Residual Disease Detection in Paediatric B Cell All Patient with Their Overall Survival and Prognosis- Experience in Tertiary Care Centre in Eastern India." **IOSR Journal of Dental and Medical Sciences** (IOSR-JDMS), 19(5), 2020,PP 1-08, **India** (Journal Publication)https://www.iosrjournals.org/iosr-jdms/papers/Vol19-issue5/Series-1/A1905010108.pdf

3. U. H. Sk*, S. Sumit, A. Rej, D. Roymahapatra, P. Manna. Development of a PAMAM dendrimer for sustained release of temozolomide against experimental murine lymphoma: Assessment of therapeutic efficacy, **ACS Appl. Bio Mater. 2021,** 4, 3, 2628–2638**.**

4. U. H Sk, S. Bhattacharya, Oxidative Stress in Cancer: Selenium as the Magic Bullet, (Springer Nature), Sajal Chakraborti et al. **(Eds): Handbook of Oxidative Stress and Cancer. (Accepted, 2021)**

5. S Ghosh, M Bssu, K Banerjee, C S Pal, T Paul, K D Bera, K D Pal, **UH Sk,** CK Panda, G Amlan, "Arsenic level in bladder tumor of patients from an exposed population; association with progression and prognosis" **Future Oncology**, **2021**, 17(11):1311-1323.

5. "**A Review on Therapeutic Strategies of Relapsed and Refractory Multiple Myeloma**." OSF Preprints. February 8. doi:10.31219/osf.io/bfj4z. [Citation 1]Dattatreya Mukherjee and Kalyan K. Mukherjee, Utpal Choudhuri. 2021.

Abstract Publication:

1. Kalyan Kusum Mukherjee, Dattatreya Mukherjee. **Role of tumor heterogeneity, tumor microenvironment and tumor initiating cell in gastric carcinogenesis from the perspective of development of hypothesis for its clinical application** [abstract]. In: Proceedings of the AACR Virtual Special Conference on Tumor Heterogeneity: From Single Cells to Clinical Impact; 2020 Sep 17-18. Philadelphia (PA): AACR; Cancer Res 2020;80(21 Suppl):Abstract nr PO-011 (Scopus indexed Q1, Web of Science Indexed IF: 12.7)

2. Kalyan K Mukherjee et al. **Significance of detecting Minimal Residual disease by Flow Cytometry on overall Survival and prognosis of Pediatric B Cell ALL patient-Experience in a tertiary care center in Eastern India**, Abstract Publication, Indian Journal of Medical and Pediatric Oncology, Scopus Q3 [Accepted, In Press]

3. Mukherjee, Dattatreya and Mukherjee, Kalyan Kusum**. Recent Advances in PI3K Inhibitor HR+/HER2- Advanced Breast Cancer, A Review Article** (August 10, 2020). ICABEE-BIO-2020, Available at SSRN: https://ssrn.com/abstract=3672430

Google Patent

2. Dattatreya Mukherjee,SUFIA IMAM,Kalyan **K Mukherjee "USE OF JAK STAT PATHWAY BLOCKER TO TREAT COVID19 PATIENTS- THE FUTURE OF COVID19 TREATMENT"**, International Journal of Creative Research Thoughts (IJCRT), ISSN:2320-2882, Volume.8, Issue 6, pp.127-131, June 2020, Available at :http://www.ijcrt.org/papers/IJCRT2006024.pdf **Authorized by FDA on Nov 19th 2020, https://www.medscape.com/viewarticle/941324) Indexed In WHO COVID19 Database :https://search.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/resource/en/ppcovidwho-1504 Indexed In Europe PMC:** PPR242621 **Preprint in SSRN:** 10.2139/ssrn.3623965 **Google Patent:** https://patents.google.com/scholar/17255439439733925130 **Citation: 1**

Conference Poster and Presentations:

2. Kalyan Kusum Mukherjee, Dattatreya Mukherjee. **Role of tumor heterogeneity, tumor microenvironment and tumor initiating cell in gastric carcinogenesis from the perspective of development of hypothesis for its clinical application** [abstract]. In: Proceedings of the **AACR** Virtual Special Conference on Tumor Heterogeneity: From Single Cells to Clinical Impact; 2020 Sep 17-18. **Philadelphia** (PA): AACR; Cancer Res 2020;80(21 Suppl):Abstract nr PO-011

Invited Lecture & Oral Presentation:

6. **Genetic Profiling in Solid Tumours-Case Series of Three Cases American Society of Clinical Oncology (ASCO) Annual Meeting 2021 (Medical Student and Resident Forum)**
   Kalyan K Mukherjee, Dattatreya Mukherjee, Priyanka Biswas, Pinakin Tandel, Ronti Ghosh, Chirantan Bose,

7. **Significance of detecting Minimal Residual disease by Flow Cytometry on overall Survival and prognosis of Pediatric B Cell ALL patient-Experience in a tertiary care center in Eastern India (Poster),** Annual Conference of Indian Society of medical oncology and pediatric oncology ISMPOCON 2020, **India** (Poster Publication) (Top 15 abstract publication. Kalyan K Mukherjee, Dattatreya Mukherjee

8. **Recent Advances in PI3K Inhibitor HR+/HER2- Advanced Breast Cancer, A Review Article** (August 10, 2020). ICABEE-BIO-2020, Available at SSRN: https://ssrn.com/abstract=3672430 [Abstract Accepted but Conference Cancelled due to COVID 19 pandemic]Mukherjee, Dattatreya and Mukherjee, Kalyan Kusum,

9. **A Review on Therapeutic Strategy on Relapsed and refractory Multiple Myeloma,** The Indian Myeloma Congress-4th International Conference from IMAGe, Sanjay Gandhi Post Graduate Institute of Medical Sciences
   Kalyan K Mukherjee, Dattatreya Mukherjee, Priyanka Biswas, Pinakin Tandel, Ronti Ghosh,

10. **EVOLVING CONCEPTS IN HER2 EVLUATION IN BREAST CANCER: HETEROGENIETY,HER-2 LOW CARCINOMAS AND BEYOND, Virtual Congress on Breast Cancer Research,** Italy (Slides: https://www2.slideshare.net/DattatreyaDATMukherj/evolving-concepts-in-her2-evaluation-in-breast-cancer Kalyan K Mukherjee, Dattatreya Mukherjee

Other academic activities:

1. Editorial Board Member of **'Nature Scientific Reports'** by Sk U H,
2 **Member subject expert committee, DCGI, MoH&FW, Govt.of India**, Kalyan K Mukherjee

Department of Environmental Carcinogenesis & Toxicology

Team

Name :	**Designation**
Head with educational qualifications	
Dr Madhumita Roy, PhD	Assistant Director Grade Scientist, OIC(R)
Faculty with educational qualification	
Dr Sutapa Mukherjee, PhD	Senior Scientific Officer I
Other Team Members	
Mr Sunit Roy	Contingent worker
Students	
Dr. Debomita Sengupta	CSIR-Senior Research Associate **(joined on 1.2.2021)**
Mr Souvick Biswas	ICMR-SRF
Ms Elizabeth Mahapatra	JRF (Institute)
Mr Archismaan Ghosh	JRF (Institute)
Ms Salini Das	CSIR-JRF

Objectives of the Department:

Objective 1: Understanding the underlying molecular mechanisms of acquired chemoresistance in breast cancer *in vitro*: Restoration by targeting Aurora A using Phenethyl Isothiocyanate (PEITC).

Objective 2: Understanding the PI3K/Akt signaling nexus involved in cisplatin resistance in cervical cancer scenario

Objective 3: Elucidation of the role of black tea in prevention of arsenic induced skin cancer

Objective 4: Characterization of radioresistant cells and manifestation of radioresistance in cervical cancer *in vitro*.

Objective 5: Verification of Aurora Kinase A regulation by stemness factors Sox2 and Oct4 and understanding the type of regulation using breast cancer cells as a model system; i.e. whether these factors control AURKA in a positive or negative manner

Brief description of the work done during the year:

A. Projects running (Extramural)

- A comparative study of the population chronically exposed to arsenic in two different demographic regions of Eastern India: Identification of responsible genes and susceptible population

PI: Dr Madhumita Roy
DBT-Twining

B. Projects running (Internal)

- **Name of the PI: Dr Madhumita Roy**: Black tea in prevention of skin cancer: A mechanistic study.
- **Name of the PI: Dr Sutapa Mukherjee**: Phenethylisothiocyanate: Role in enhancing

platinum accumulation in cervical cancer

C. Student's Project:

- **ICMR-SRF:** Understanding the underlying molecular mechanisms of acquired chemoresistance in breast cancer *in vitro*: Restoration by targeting Aurora A/B axis using Phenethyl Isothiocyanate (PEITC)
- **CSIR-JRF**: Molecular Targeting of GADD45a and AURKA: A Therapeutic approach to reverse radioresistance in cervical cancer
- **CSIR-SRA:** Role of Oct4 and Sox2 in p53 or Myc mediated transcriptional regulation of Aurora Kinase A and its implications on cell polarity during cell division with reference to cancer

D. Publications / Monographs / Patents etc.

i) Roy Madhumita, Datta Amitava (2020). Phytochemicals for Controlling Obesity-Related Cancers. **Novel Approaches in Cancer Study**; 4(5). NACS.000600. 2020. DOI: 10.31031/NACS.2020.04.000600.

ii) Ghosh Archismaan, Roy Madhumita (2020). Prevalence of Gallbladder Cancer in Arsenic Endemic Areas. **Novel Approaches in Cancer Study;** 4(4). NACS.000593. DOI: 10.31031/NACS.2020.04.000593

iii) Kiran Ravi, Tyagi Swati, Abbas Syed, Roy Madhumita, Taraphder A (2020). Immunomodulatory role of black tea in the mitigation of cancer induced by inorganic arsenic. **Eur. Phys. J. Plus;** 135: 735-758. https://doi.org/10.1140/epjp/s13360-020-00766-1

iv) Biswas Souvick; Mahapatra Elizabeth; Roy Madhumita; Mukherjee Sutapa (2020). PEITC by regulating Aurora Kinase A reverses chemoresistance in breast cancer cells. **Indian J Biochem Biophys;** 57(2): 167-177. ISSN: 0975-0959 (Online); 0301-1208 (Print)

v) Mahapatra Elizabeth, Biswas Souvick, Roy Madhumita, Mukherjee Sutapa (2020). Inflammation: A protagonist in development of carcinogen induced cervical cancer in mice. **Indian J Biochem Biophys**; 57(2): 158 – 166. ISSN: 0975-0959 (Online); 0301-1208 (Print).

vi) Ghosh Archismaan, Mukherjee Apurba, Mukherjee Sutapa, Roy Madhumita, Datta A (2021). Modulatory role of tea in arsenic induced epigenetic alterations in carcinogenesis. **The Nucleus**; https://doi.org/10.1007/s13237-020-00346-9

vii) Biswas Souvick, Mahapatra Elizabeth, Ghosh Archismaan, Das Salini, Roy Madhumita, Mukherjee Sutapa (2021). Curcumin Rescues Doxorubicin Responsiveness via Regulating Aurora a Signaling Network in Breast Cancer Cells. **Asian Pacific Journal of Cancer Prevention**; 22(3): 957-970. Doi: 10.31557/APJCP.2021.22.3.957.

viii) Roy Madhumita, Datta Amitava (2021). Phytochemicals in ROS Mediated Epigenetic Modulation of Cancer. **Handbook of Oxidative Stress in Cancer: Mechanistic Aspects; Springer Nature** [Chakraborti, Sajal, Ray, Bimal K, Roychowdhury, Sushanta (Eds.)]. 1st Edition, Springer ISBN 978-981-15-9412-0.

E. Other academic activities

a) PRESENTATIONS:

1. **Dr. Madhumita Roy participated in several Webinars**

- **NABL Accreditation of RT PCR RNA Virus testing** held on June 5, 2020
- **Annual Conference of Oncology Forum , in Association with the International Society of Geriatric Oncology (SIOG)** held during **December 4-6, 2020**
- **40th annual conference of IACR,** organized by **ILS, Bhubaneswar on March 1, 2021**
- International Webinar on **The Relevance of Omics and Regenerative Medicine in the Pandemic Situation (5th Edition); Organized by Dept. of Zoology, University of Kerala held during March 27th - 29th, 2021**
- **Central Vigilance Commission Adopted the Integrity Pledge** and is committed to uphold **highest standards of honesty & integrity and to follow probity and rule of law in all walks of life**

2. **Dr. Sutapa Mukherjee acted as an Invited Speaker in the** Online International Inaugural Lecture Series, hosted by DST-FIST Center, MIET, Meerut held on February, 20, 2021.

3. **Dr. Sutapa Mukherjee participated in the**

- **Webinar Series** organized by Progress and Prospects of Biology, University of Calcutta on the topic **"DNA synthesis by DNA polymerases: old questions and new answers"** held on August 2, 2020**.**

- **Webinar Series** organized by Progress and Prospects of Biology, University of Calcutta on the topic **"Mighty regulation of a tiny regulator: the miRNA movement"** held on August 16, 2020

- **Webinar Series** organized by Progress and Prospects of Biology, University of Calcutta on the topic **"Chromatin Readers as Regulators of Cancer Epigenome"** held on November 15, 2020.

- **Webinar on "Cancer stem cells- survival of the smartest"** delivered by Prof. Tanya Das, ICMR Emeritus Scientist, Bose Institute, Organized by Dept of Zoology, University of Calcutta on 29 .11.2020.

4. **Mr. Souvick Biswas (ICMR-SRF)** participated in the webinar series

- A webinar on "**Advanced ovarian cancer prolonging survival in the present decade**", organized by the International Association of Oncology IAO, Bhubaneshwar, Khurda (District) Odisha, India, July 25, 2020.
- Webinar Series, Progress & Prospects in Biology 2020, on "**DNA synthesis by DNA polymerase: old questions and new answers**", organized by Multi-institute alumni of Zoology, Mentored by the Translational Outcomes Research Group, Department of Zoology, University of Calcutta, Kolkata, India, August 2, 2020.

- A webinar on "**A decade of progress in cancer supportive care: Myth or Reality**?",organized by the International Association of Oncology IAO, Bhubaneshwar, Khurda (District) Odisha, India, August 8, 2020.
- A webinar on "**Squamous cell cancer of Head and Neck: Our own problem**", organized by the International Association of Oncology IAO, Bhubaneshwar, Khurda (District) Odisha, India, August 15, 2020.
- Webinar Series, Progress & Prospects in Biology 2020, on "**Mighty regulation of a tiny regulator: the miRNA movement**", organized by Multi-institute alumni of Zoology, Mentored by the Translational Outcomes Research Group, Department of Zoology, University of Calcutta, Kolkata, India, August 16, 2020.
- International Virtual Guest Lecture on "**Theranostics Approaches to Cancer Management**", Organized by Department of Zoology, Kongunadu Arts And Science College (KASC),Coimbatore (Dist.), Tamil Nadu, India, August 21, 2020.
- A webinar on "**Cervical cancer: Isn't talked about much**", organized by the International Association of Oncology IAO, Bhubaneshwar, Khurda (District) Odisha, India, August 22, 2020.
- A webinar on "**Updates in the management of Pancreatic Cancer**", organized by the International Association of Oncology IAO, Bhubaneshwar, Khurda (District) Odisha, India, August 29, 2020.

5. Ms Elizabeth Mahapatra (SRF-Institute) participated in the following Webinars

- Attended webinar series entitled **"Progress & Prospects in Biology"** organized jointly by University of Calcutta between **October, 2020** and **December, 2020**.

- Attended a webinar entitled **"The Concept of Cancer Stem Cells: Progress and Promises"** under the series **"Webinar-The Biomics"** organized by National Institute of Biomedical Genomics, Kalyani on 8.11.2020.

- Attended a webinar entitled **"Controlling Stem Cell Fate through Intracellular Trafficking"** under the series **"Webinar-The Biomics"** organized by National Institute of Biomedical Genomics, Kalyani on 8.11.2020.

- Attended a webinar entitled **"Effective RNA Extraction for COVID-19 testing"** organized by Confederation of Indian Industry on 13.04.2020.

- Attended a webinar of **40th Annual Conference of Indian Association for Cancer Research (IACR)** organized by Institute of Life Sciences, Bhubaneswar on 01.03.2021.

- Attended webinar series entitled **"Biology" Webinar Series"** organized by University of Calcutta in **April, 2020** and **May, 2020**.

6. Mr Archismaan Ghosh (SRF-Institute) participated in the following webinars

- International Webinar on **The Relevance of Omics and Regenerative Medicine in the Pandemic Situation (5th Edition)Organized by Dept. of Zoology, University of Kerala.** In Partnership with Society for Translational Cancer Research | Society for Nutraceuticals and Chronic Diseases| Society for Alternatives to Animal Experiments India | Kerala Academy of Sciences | Association of British Scholars Thiruvananthapuram Chapter. March 27th to March 29th, 2021.

- **40th Annual Conference of Indian Association for Cancer Research,** organized by**: Institute of Life Sciences**, Bhubaneswar held on 1st March 2021.

- Attended a webinar entitled "**The Concept of Cancer Stem Cells: Progress and Promises"** under the series **"Webinar-The Biomics"** organized by National Institute of Biomedical Genomics, Kalyani on 8.11.2020.

- Attended a webinar entitled **"Controlling Stem Cell Fate through Intracellular Trafficking"** under the series **"Webinar-The Biomics"** organized by National Institute of Biomedical Genomics, Kalyani on 8.11.2020.

- Attended a webinar entitled **"Effective RNA Extraction for COVID-19 testing"** organized by Confederation of Indian Industry on 13.04.2020.

7. Ms Salini Das (CSIR-JRF) participated in the following webinars

- Webinar on evolving strategies for the management of **B raf mutant metastatic lung cancer and melanoma**. Organised by International Association of Oncology on 20 September 2020
- Webinar on **Cancer stem cells- survival of the smartest** delivered by Prof. Tanya Das, ICMR Emeritus Scientist, Bose Institute, Organized by Dept of Zoology, University of Calcutta on 29 .11.2020
- A webinar on "**Advanced ovarian cancer prolonging survival in the present decade**", organized by the International Association of Oncology IAO, Bhubaneshwar, Khurda (District) Odisha, India, July 25, 2020.
- Webinar Series, Progress & Prospects in Biology 2020, on "**DNA synthesis by DNA polymerase: old questions and new answers**", organized by Multi-institute alumni of Zoology, Mentored by the Translational Outcomes Research Group, Department of Zoology, University of Calcutta, Kolkata, India, August 2, 2020
- A webinar on "**A decade of progress in cancer supportive care: Myth or Reality**?", organized by the International Association of Oncology IAO, Bhubaneshwar, Khurda (District) Odisha, India, August 8, 2020.
- Webinar Series, Progress & Prospects in Biology 2020, on "**Tracking Immunity as and when it evolves: In health and in sickness**", organized by Multi-institute alumni of Zoology, Mentored by the Translational Outcomes Research Group, Department of Zoology, University of Calcutta, Kolkata, India, August 9, 2020.
- A webinar on "**Squamous cell cancer of Head and Neck: Our own problem**", organized by the International Association of Oncology IAO, Bhubaneshwar, Khurda (District) Odisha, India, August 15, 2020.

- Webinar Series, Progress & Prospects in Biology 2020, on "**Mighty regulation of a tiny regulator: the miRNA movement**", organized by Multi-institute alumni of Zoology, Mentored by the Translational Outcomes Research Group, Department of Zoology, University of Calcutta, Kolkata, India, August 16, 2020.
- International Virtual Guest Lecture on "**Theranostics Approaches to Cancer Management**", Organized by Department of Zoology, Kongunadu Arts And Science College (KASC), Coimbatore (Dist.), Tamil Nadu, India, August 21, 2020.
- A webinar on "**Cervical cancer: Isn't talked about much**", organized by the International Association of Oncology IAO, Bhubaneshwar, Khurda (District) Odisha, India, August 22, 2020.
- A webinar on "**Updates in the management of Pancreatic Cancer**", organized by the International Association of Oncology IAO, Bhubaneshwar, Khurda (District) Odisha, India, August 29, 2020
- A webinar on "**Role Of Afatinib in managing EGFR mut+ve patients and sequencing of lung TKIs"**, organized by the International Association of Oncology IAO, Bhubaneshwar, Khurda (District) Odisha, India, September 5, 2020.

b) PhD awarded – Dr Apurba Mukherjee, carried out her research work under Dr Madhumita Roy (Supervisor) and Dr Sutapa Mukherjee (Joint Supervisor) has received her PhD Degree from Jadavpur University.

c) Students undergoing PhD:

- Mr Souvick Biswas (registered, CU)
- Ms Elizabeth Mahapatra (registered, JU)
- Mr Archismaan Ghosh (registered, JU)
- Ms Salini Das (registered, CU)

d) Interesting observations

Observation 1: Development of acquired paclitaxel-resistance is a major obstacle to breast cancer therapy for the last couple of decades because of low responsiveness of taxol- resistant breast cells to the chemotherapeutics. Behind the molecular mechanisms as we have, so far, studied; Aurora kinase A and B are found to be the keystone molecules that can elicit paclitaxel resistance by increasing the expression of several drug efflux markers. To ensure the involvement of Aurora A and B and downstream signaling pathways associated with Aurora kinase in the development of acquired chemoresistance, we ectopically expressed both Aurora A and Aurora B. It was observed that, with this ectopic overexpression, confirmed by western blotting analysis, downstream signaling molecules like Ikβα (phospho ser 32), Akt (phospho Ser 473) and Histone H3 (phosphor Ser 10) had been overexpressed in MCF-7 cells. The overexpression of downstream molecules along with Aurora A, in turn, releases NFκB p65 subunit to the nucleus, resulting in the overexpression of Pgp1 (a drug efflux marker). Aurora B ectopic overexpression is associated with the overexpression of H3 (phosphor Ser 10), which in turn, increases the mitotic index, and also escaping the apoptosis by avoiding PKC delta mediated apoptotic condensation. Furthermore, MTT was also performed to check the resistance index (EC50 of paclitaxelin MCF-7 cells after ectopic overexpression) / EC50 of paclitaxel in MCF-7 cells without ectopic overexpression) in MCF-7 cells. It was observed that the resistant index of paclitaxel significantly increased

confirming its role in the development of acquired pacli-resistance. That data corroborates with MCF-7$^{Pacli/R}$ cells that we have developed last year. To verify further, we have used siRNA of Aurora A and Aurora B.

Observation 2: Acquired cisplatin resistance stymies cervical cancer medicaments. Prosurvival signaling pathways; particularly PI3K/Akt pathway is highly implicated for acquirement of platinum resistance in cervical cancer. The present study aims to overcome acquired cisplatin resistance by targeting few key effectors of the PI3K/Akt prosurvival pathway such as Akt1, PAK4, XIAP and survivin with a natural isothiocyanate -Phenethylisothiocyanate (PEITC) in cervical cancer. Two models- an *in vitro* model and an *in vivo* model have been developed respectively. A cisplatin resistant sub line of cervical carcinoma cell line SiHa, has been developed as an *in vitro* model alongside development of a 3methylcholanthrene (chemical carcinogen) induced *in vivo* cervical cancer model using Swiss Albino Mice (Mus musculus). Findings of animal experimentations delineated systemic stress, induced by unremitted inflammation, as the driver of cervical neoplastic progression. Persistent crosstalk of inflammatory mediators through the developmental phases of cervical cancer developed a "positive feedback loop" which deregulated tumour suppressor proteins and eventuated in exacerbated levels of prosurvival molecules (Akt1, PAK4, XIAP and survivin) in the cervical niche. This remained unaltered even after cisplatin administration in the *in vivo* model. Such protein expression trends of these molecules corroborated with that exhibited by the terminally resistant sub line of SiHa. Altered spatial distribution of the major cisplatin efflux pumps along with their increased expression in cell protein extracts was noted. This study indicated that deregulated prosurvival molecules rendered cervical cancer cells evasive of platinum-based chemotherapy with cisplatin.

Observation 3: Groundwater inorganic arsenic (iAs) contamination is a major health hazard world-wide. Chronic exposure to inorganic arsenic leads to numerous diseases, skin cancer being one of the most frequent and deadliest amongst them. The in-vitro work has been carried out in swiss albino mice which were exposed to iAs chronically. This led to iAs accumulation within their tissues. IAs mediates its carcinogenic activity by excess generation of reactive oxygen species (ROS) and reactive nitrogen species(RNS) which further leads to DNA, lipid and protein damage. IAs has also been found to inhibit the activity of antioxidant enzymes and of DNA repair enzymes thus further aggravating the process of cancer development. Black tea, a popular drink and an effective quencher of ROS has been used in this study as a chemopreventive agent to counter the damages done by chronic iAs exposure and halt carcinogenesis. Another mechanism through iAs induces carcinogenesis is through epigenetic modulations. Colorimetric assays have revealed that administration of iAs to the mice led to alteration of methylation status of H3K4. Western blotting and Immunohistochemistry assays have revealed that increase of methylations H3K4me1 and H3K27me3 while significant reduction in the methylation of H3K4me3 in the mice tissue. Modulation of expression of various methyl transferases like MLL1, MLL3 and EZH2 along with alteration of demethylases like LSD1 and KDM6A have also been observed. Chronic iAs exposure also leads to reduction of H4K16ac (acetylation) and MYST1, an acetyl transferase. All these epigenetic alterations have been found to promote carcinogenesis, while black tea administered mice did not show such drastic epigenetic modulations, indicating that, it may halt carcinogenetic epigenetic modulations of iAs. Epithelial to mesenchymal transition(EMT) is an important phenomenon which occurs during carcinogenesis. IAs promotes EMT within the tissue. Western blotting and IHC studies have revealed that with Chronic iAs administration the mesenchymal markers like Vimentin, N-cadherin, Snail, Slug, Zeb and Twist have shown increased expression within the tissues, the epithelial markers like E-cadherin, and Desmoplakin

have been greatly reduced. While the black tea administered mice showed comparatively higher expression of epithelial markers and lower expression of mesenchymal markers thus again proving to be an effective chemopreventive agent against iAs induced carcinogenesis. TGFβ pathway plays an important role in promotion of EMT. Our investigation has revealed that iAs promotes the downstream mediators of this pathway like PI3K and phospho-AKT which further promotes the expression of transcriptions factors like Snail, Twist etc. which further induce carcinogenesis. While the expression of these mediators have been found to repressed in the black tea administered mice indicating again that black tea can be a potent chemopreventive agent which may cease the progression of carcinoma in the chronically iAs induced individuals. The in-vivo work of development of carcinoma in the Hacat cells by chronic exposure to iAs is in progress.

Observation 4: Development of radioresistant cervical cancer cell line by chronic exposure to X ray in parental Cervical cancer cell SiHa. Expression study of DNA damage markers (P53, ku70, GADD45A, Gamma H2AX etc); mitotic kinase (AURKA); prosurvival marker (Akt, NF-κB). Cell cycle analysis shows G2/M progression which added advantage in acquisition of Radioresistance. Intracellular ROS accumulation and checking the expression of hypoxic biomarker HIF1a was also carried out. Apoptotic study by DNA fragmentation and PI staining was performed to check radiation induced apoptosis. Invasive properties of radioresistant cells were found by wound healing assay. Overall work summarizes that acquired radioresistance is achieved by chronic challenges of X ray and this is accompanied by increased survival strategy of cells and evasion of apoptosis.

Observation 5: The project has been commenced on February, 2021. Therefore the work has just initiated.

e) Training Program: Due to COVID pandemic situation, Short-Term Training Programmes were kept in abeyance in the year 2020-2021.

f) Miscellaneous:

i) **Dr Madhumita Roy** was appointed as the PhD viva voce examiner at IIT, Guwahati and Department of Botanical & Environmental Sciences, Guru Nanak Dev University, Amritsar.

ii) **Dr Madhumita Roy** being supervisor of Ms Apurba Mukherjee, acted Viva Voce Examiner of the thesis entitled "Curcumin as Supplement with Conventional Chemotherapeutic Drugs in Modulation of Tumor Markers in Leukemia Cell Lines" held on November 18, 2020, submitted by Ms Apurba Mukherjee at Jadavpur University.

iii) **Dr. Madhumita Roy** Acted as reviewer of international peer reviewed journals like ***Food and Chem Toxicol, Env Toxicol, Human Exptl Toxicol, J Ethnopharmacology, Current Med Chem, Drug Delivery J, Tumor Biol, Int J Cancer, Mut Res.***

iv) **Dr Madhumita Roy** being a senior scientist contributed to research by guiding PhD student, publishing research articles in peer reviewed journals, presenting laboratory work in conferences.

v) **Dr. Madhumita Roy** being the Officer-in-Charge (Research) of CNCI took the following initiatives

- **Central Research Instrument Facility (CRIF) has been re-structured and renovated to make room for new equipment and for better utilization of space.**
- **Responsibilities of different equipment have been distributed among scientists for smooth running of CRIF.**
- **RT-PCR based COVID testing facility was created (approved by ICMR) at the CNCI Campus, Rajarhat, Kolkata.**
- **Organised several outreach activities in schools and colleges to highlight the importance of cancer awareness among the teachers and students.**
- **Being a member of Internal Complaint Committee (ICC), actively involved to sort out harassments and complains at work place.**
- **Being a member of Institutional Ethics Committee (IEC), dealt with ethics issues related to use of human samples.**
- **Acted as a Co-Chairperson in the Institutional Biosafety Committee conducted virtual meeting**

- **Organising monthly meeting with all scientists to discuss various issues/problems pertaining to research wing of CNCI and to sort out problems to run research work smoothly.**
- **Relocation of space so that all scientists get equal space/opportunity to work.**
- **Clearing of corridors of all floors of CNCI Research for fire safety and easy movement.**
- **As HOD, CRIF, organised regular meetings with CRIF Committee members for formulating and maintaining SOP for all equipment.**
- **During the COVID-19 pandemic, a RT-PCR based COVID testing facility was created in CNCI New Campus, Rajarhat, Kolkata, where regular RT-PCR based testing is being carried out.**
- **Organised largescale production of sanitizer for use in CNCI hospital and research.**
- **As the Chairperson of the Academic Committee, facilitated and streamlined several academic activities of CNCI Research.**
- **Set up the Institutional Biosafety Committee (IBSC), which was sanctioned by DBT, Govt. of India.**

vi) **Dr Sutapa Mukherjee** acted as Viva Voce Examiner of the thesis entitled "Curcumin As Supplement with Conventional Chemotherapeutic Drugs in Modulation of Tumor Markers in Leukemia Cell Lines" held on November 18, 2020; submitted by Ms Apurba Mukherjee at Jadavpur University.

vii) **Dr Sutapa Mukherjee** acted as a reviewer of International peer reviewed journal under ELSEVIER, SAGE and Willey Online Library publication.

viii) **Dr Sutapa Mukherjee** acted as a Thesis Examiner of a thesis entitled: "**A Study On The Biochemical And Immunological Parameters In Oral Cancer And Oral**

Precancerous Lesions In North Indian Population" of a PhD aspirant of Amity University, Noida

ix) **Dr. Sutapa Mukherjee** has contribution to Academic Administration of the Institute by acting as Academic Coordinator since February, 2013.

Epidemiology and Biostatistics

Team

Head of the Department:

Dr. Syamsundar Mandal, PhD (BHU), MPS (IIPS, Mumbai), Course on Computer Programming and Application (ISI, Kolkata), Course on Cancer Epidemiology (IARC, WHO)
Statistical Officer

Project Staff:

Population Based Cancer Registry and Population Based Cancer Survival, Kolkata

Ms. Soumya Roy, Social Investigator
Mr. Biswajit Bhattacharya, Data Entry Operator cum Social Investigator
Ms. Indrani Nandi, Social investigator
Ms. Pranati Sarker, Social investigator
Mr. Biswanath Ghosh, Social investigator
Ms. Soma Das, Social investigator

Hospital Based Cancer Registries and Patterns of Care and Survival Studies on cancer Breast, Cancer Cervix, Gall Bladder and Head and Neck Cancers

Dr. Sushmita Roy	Research Scientist (Medical)
Ms. Soumi Sinha	Statistician
Mrs. Julekha Mondal (Mallick)	Social Worker
Mrs. Kaberi Biswas	Social Worker
Mrs. Sudeshna Ghosh	Social Worker
Ms. Rinki Chitrakar	Social Worker
Mr. Dipanjan Mazumdar	Data Entry Operator
Ms. Priya Kumari Singh	Data Entry Operator
Ms. Sushmita Patra	Data Entry Operator

Objectives

Reducing Cancer Burden through Research

This department aims at reducing cancer morbidity and mortality through research that combines traditional study designs with innovative new approaches.

The staff members of this department devote their specialized skills in epidemiology, biostatistics, population science, health outcomes, and computational oncology toward several key areas of cancer research. These focus on the causes of cancer, as well as strategies for cancer prevention, diagnosis, and treatment.

Noninfectious disease (NCD) can include a local risk for a particular type of cancer or a high rate of incidence in a particular community. This department conducts study the potential factors that contribute to these conditions.

Also this department focuses on cancer prevention by investigating the etiology of cancer and by evaluating the effect of screening. Primary prevention investigations have focused on the study of genetic susceptibility to cancer.

The activity of the Biostatistics has traditionally fallen into three broad categories: long-term collaborative projects, short-term projects and research on new statistical methods.

Current long-term collaborative projects with ICMR-NCDIR which include: two Population Based Cancer Registries and Population Based Cancer Survival (PBCR & PBCS), one in urban set up, PBCR & PBCS, Kolkata and another in rural set up, PBCR & PBCS, Daspur. However, PBCR & PBCS, Daspur run by institutional resources.

Short-term projects include, but are not limited to, protocol design, grant applications, and statistical analysis.

This department also pursues research interests in statistical methodology. Our interests span cancer prevention, diagnosis and treatment (clinical trials) as well as specialized research in survival analysis, statistical genetics, and computer, intensive methods.

As the HOD is also Population Scientist researches are going on changing pattern of cancers with the changing pattern of populations.

Geospatial analysis of risk factors of female breast cancer, cervix cancers and head & neck cancers in West Bengal

The goal of this project is to characterize underlying factors contributing to the high cancer incidence of the mentioned in West Bengal. Using geographic information systems, assessment will be made the geographic distribution of the mentioned cancers in West Bengal in relation to agriculturally-zoned land and are incorporating district- level data to examine the prevalence of known risk factors of the cancers of mentioned sites in the region which may contribute to the elevated burden of cancers of the mentioned sites. This community-driven research will be led by Director, CNCI.

Machine learning to predict cancer screening in rural and urban populations.

This study will aim to compare model performances of a random forest model to multiple regression in identifying predictors of cancer screening behaviors across urban and rural West Bengal. Using multiple district datasets, a team of clinicians, epidemiologists, population scientist, data scientists, digital health scientists and biostatisticians of West Bengal will work on this project.

Indian Institute of Technology (IIT), Kharagpur and Banaras Hindu University, International Institute of Population Sciences, Mumbai and Indian Statistical Institute will be requested to participate

The department is having only project staff working in the projects funded by National Centre for Disease Informatics and Research (NCDIR), ICMR. It has three wings:

In the field of Epidemiology:

1. First wing is working for study on the cancer patients reported to the hospital of this institute under the extramural projects entitled Hospital Based Cancer Registry (HBCR) and Hospital Based Pattern of Care and Survival Studies on Cancer Cervix, Breast, Head & Neck Cancers, Gall Bladder Cancer and implementation of NCDIR e-Mor Software to strengthen the Medical Certification of Cause of Death (MCCD).

   Brief Report for the year 2016:

   Total Cases – 5716 (Male-2948(51.6%); Female- 2768(48.4%)

2. Second wing is working in the urban community to assess the cancer burden in Kolkata under Population Based Cancer Registry (PBCR), Kolkata and Pattern of Care and Population Based Survival Studies on Cancer Cervix, Breast, Head & Neck Cancers based on 4.5 million of 144 wards of Kolkata Municipal Corporation covering 206.08 sq. km.

   Brief Report for the year 2012-15

   Among males lung (22.0%) followed by prostate (6.9%) were leading primary sites and in females breast (24.8%) and cervix (9.9%) were two leading primary sites. Cancer in gall bladder was also in ten leading sites in both male (3.4%) and female (7.3%).

   In Kolkata tobacco associated cancers among males and females were 46.7% and 15.4% respectively.

   The death due to cancers among males with Crude Mortality Rate of 46.1 per 100,000 population which was higher than that of females with Crude Mortality Rate of 38.3 per 100,000 population.

3. Third wing is working in the rural community to assess the cancer burden in Community Development Block Daspur-I & II in the district of Paschim Medinipur, West Bengal under Rural Population Based Cancer Registry (Rural PBCR), Daspur since 01-01-2020 covering 314 villages with population 4.5 lakh and 333.75 sq. Km.

   In preliminary stage the information are being collected of all the cancer patients with pre-designed questionnaire consisting of 72 questions and well designed software have been software have been developed to enter data. House visits are being performed after getting information of the patients through health workers. Verbal autopsy also is introduced to get all the 72 information of the deceased cancer patients.

4. Evidence Based Interventions for Cancer Screening and Management in the district of Paschim Medinipur, West Bengal. In this pilot project Paschim Medinipur, West Bengal is one of 6 districts of India. HOD of this department has been as the Team Leader of eastern India by the MoHFW, Government of India. Under this project several meetings are being conducted with health workers in first two pilot community blocks of Daspur-I and Daspur-II. As a result number of patients have been identified by the health workers even during complete Lock Down due to Corona Pandemic.

In the field of Biostatistics:

1. The department conducts classes for DNB Students, Research Scholars and students of Medical Physics.
2. The department has started outsourcing by conducting classes on research methodology for the DNB of students of other institutions/hospitals.
3. The department is helping both clinical and basic researchers for their design and analysis of data of research works.

Other academic activities

Oral Paper presented:

Number of oral presentations was delivered lectures on cancer registrations, cancer survival and cancer awareness by the HOD in different meetings.

Special Achievements at a glance:

1. ICMR-NCDIR declared CNCI as a **Centre of Cancer Registries.**
2. HOD of this department has been nominated as the Team Leader of eastern India for Population Based Screening of Breast, Cervix and Head & Neck Cancers by the MoHFW, Government of India.
3. HOD of this department has been nominated as the Nodal Officer for assessment of Childhood Cancers of West Bengal by ICMR-NCDIR
4. Published Book on "Estimated cases of cancer in different districts of West Bengal for the year 2020"
5. Collaborative research work is going on with RCC, Agartala, Tripura, for comparative study of patterns of cancers in PBCR, Kolkata and PBCR, Tripura.

List of projects

1. **Intramural project entitled "Population Based Cancer Registry (PBCR) and Population Based Survival Studies of the patients with cancer of all primary sites, Daspur"**

Principal Investigators (Joint)

1. Dr. Jayanta Chakrabarti
2. Dr. Syamsundar Mandal

Summary:

Objectives of the proposal

Out of 38 PBCRs in India 37 PBCRs are based on urban population. The only rural PBCR in India of Barshi, Maharashtra is not based on purely rural population. Thus this PBCR, Daspur, Paschim Medinipur, West Bengal will provide the information about the prevalence of cancers among the rural people. It is based on 314 villages with approximate population of 5 lakh.

Specialty of the registry area according to geographical location and varieties in population:

- Being a flood prone area it can be called as the 'Bath Tub of West Bengal' due to its geographical location. Thus immigration of outsiders for permanent settlement in this area is almost nil. The peoples of this region are staying here generation and after generation without mixture of peoples of other region of this country. As a result of that genetic mutation in terms of mixture of different populations is comparatively less which help to conduct any translation research related to genetic mutation. So the research work related to the hypothesis whether cancer is hereditary or not may be carried out in near future.
- This is situated at about 72 km away from Kolkata and about 30 km from nearest suburban area. So the proposed PBCR will be based on purely rural population.This region is inhabited by a number of scheduled tribe populations which will help to conduct any research work related to pattern and trend of cancers among the tribal population.
- The number of AIDS patients is comparatively higher (about 532 patients) in this region. The research work related to pattern of cancer among AIDS patients may also be conducted in this region.
- The information on status of health at last contact the patients will be collected through house visits / through telephonic interview.

2. Pattern of Care and Survival Studies of Gall Bladder Cancer

Principal Investigators

Dr. Jayanta Chakrabarti

Co-Principal Investigators

1. Dr. Debarshi Lahiri
2. Dr. Syamsundar Mandal

Summary:

Objectives of the proposal

From the report of the cancer registries in India prevalence of gall bladder cancer is prevalent in higher proportion in the Gangetic region as compared to other regions of India. Thus NCDIR, ICMR launched this project through the cancer centres situated in the Gangetic region.

In this study the details of the patients will be collected from the medical records of the patients from Medical Records Unit of the Hospital Wing. For some questions the patients/patients' may be interviewed.

The information on status of health at last contact the patients will be collected from the medical records during follow-up visit of the patients. For the patients who will be lost to follow-up the information of the status of health will be collected through telephonic interview.

3. Implementation of NCDIR e-Mor for strengthening MCCD system in Hospitals.

Principal Investigators

1. Dr. Syamsundar Mandal

Co-Principal Investigators

1. Dr. Deepa Chakrabarti

2. Dr. Shankar Sengupta

Summary:

Objectives of the proposal

All the information of the patients who died during treatment at hospital of CNCI will be collected and entered into computer with NCDIR e-Mor for strengthening MCCD system in Hospitals.

4. Intramural project entitled "Educational intervention to promote treatment and follow-up compliance in cancer patients"

Principal Investigators (Joint)

1. Dr. Deepa Chakrabarti

2. Dr. Syamsundar Mandal

Summary:

Objectives of the proposal

Non-compliance to treatment and follow-up is very common for the patients suffering from cancer. It is assumed that each and every new patient is potential non-compliant during the investigations, treatments and follow-up after registration Thus through this project information of different parameters which are related to non-compliance of the patients

5. Extramural project entitled "Population Based Cancer Registry (PBCR), Kolkata"

Principal Investigators

1. Dr. Syamsundar Mandal, Head, Epidemiology & Biostatistics

Co-Principal Investigators

1. Dr. Durgaprasad Nanda, SMO, Surgical Oncology

2. Dr. Samir Bhattacharya, Head, Division of Research; Saroj Gupta Cancer Centre & Research Institute (SGCC&RI), Thakurpukur

Co- Investigator

1. Dr. Arpita Chandra

Summary:

Objectives of the proposal

It is one of the 38 PBCRs in India which is based on population of Kolkata. The information of cancer patients are being collected from different participating centres from in and around Kolkata. It is based on 144 wards of Kolkata comprising of about 4.5 million populations.

It provides incidence and prevalence rates of different cancers.

6. **Population Based Cancer Survival Studies of Ca-Head & Neck, Ca-Breast and Ca-cervix registered under PBCR, Kolkata during the period 2014-16**

Principal Investigators

1. Dr. Syamsundar Mandal, Head, Epidemiology & Biostatistics

Co-Principal Investigators

1. Dr. Durgaprasad Nanda, SMO, Surgical Oncology

2. Dr. Samir Bhattacharya, Head, Division of Research; Saroj Gupta Cancer Centre & Research Institute (SGCC&RI), Thakurpukur

Summary:

Objectives of the proposal:

Under this project the information of present health status of the patients of the mentioned sites are being collected from the participating centres of PBCR and through house visits, if required. Also information of health status will be collected through telephonic interview.

This will provide the population based pattern of survival of the patients with mentioned sites.

7. **HBCR - Chittaranjan National Cancer Institute, Kolkata**

Principal Investigator

1. Dr. Syamsundar Mandal, Head of the Dept. Epidemiology & Biostatistics

Co-Principal Investigator

1. Dr. Partha Nath, SMO, Medical Oncology

Co- Investigator

1. Mr. Ganesh Garai

Summary:

Objectives of the proposal

The information of cancer patients are being collected from medical records (BHT) of the patients being registered at CNCI Hospital.

It provides pattern of cares provided to the patients along with their primary sites.

8. **Hospital Based Cancer Survival Studies of Ca-Head & Neck, Ca-Breast and Ca-cervix registered under HBCR, CNCI**

Principal Investigator

1. Dr. Syamsundar Mandal, Head of the Dept. Epidemiology & Biostatistics

Co-Principal Investigator

1. Dr. Partha Nath, SMO, Medical Oncology

Co- Investigator

1. Mr. Ganesh Garai

Summary:

Objectives of the proposal

Under this project the information of present health status of the patients of the mentioned sites are being collected from the medical records of the patients registered and treated at CNCI. Also information of health status will be collected through telephonic interview.

This will provide the pattern of care and survival of the patients of CNCI of the mentioned primary sites.

9. **Evidence based interventions for cancer screening and management**

Team Leader of eastern India

1. Dr. Syamsundar Mandal

Member

1. Dr. Debarshi Lahiri

2. Dr. Manisha Venrnekar

Summary:

Objectives of the proposal

MoH&FW has lunched pilot project on Population Based Screening (PBS) for Ca-Breast, Ca-Head & Neck and Ca-Cervix in 7 districts of India situated at different regions of India. Under this programme PBS will be started for the mentioned sites in the district of Paschim Medinipur, West Bengal.

10. Situational analysis of childhood cancer services in India
Nodal Officer of West Bengal

1. Dr. Syamsundar Mandal

Aim and Objectives

Aim: To assess the status of childhood cancer care services in India

Objectives:

Primary: To assess the

(i) Availability of childhood cancer care services
(ii) Facility preparedness, treatment-related practices and referral linkages in childhood cancer care.
(iii) Barriers and facilitators in the provision of childhood cancer care services

Secondary: To provide recommendations for framing programme and policies directed towards childhood cancer control.

List of publication: 2020-21

1. Ray S, Saha D, Alam N, Mustafi SM, Mandal S, Sarkar A, Majumder B, Murmu. Exposure to chewing tobacco promotes primary oral squamous cell carcinoma and regional lymph node metastasis by alterations of SDF1α/CXCR4 axis. 2021 International Journal of Experimental Pathology Impact Factor- 1.672 USA 102(2) 80 -92
2. Chakrabarti D, Ray S, Mandal S. Awareness regarding different aspects of cancer and access to the treatments of cancer of the patients attending at a pioneer regional cancer centre of eastern India. 2021 International Journal of Medical and Biomedical Studies Index Copernicus Value 2019: 79.34 Canada 5(2):82-89.
3. Chakrabarti D, S, Mandal H, Mandal S. Change of duration of hospital stay of the cancer patients over a decade at a region cancer centre of eastern India 2021 International Journal of Creative Research Thoughts (IJCRT) Impact Factor-7.97 India 9(3):81-93.
4. Mandal S, Chakrabarti J Projection of new cancer cases in the state of West Bengal, India – 2020. 2021 International Journal of Medical and Biomedical Studies Index Copernicus Value 2019: 79.34 Canada 5(3):109-120.
5. PK, Sarkar S, Ghosh D, Mahata S, Pal R, Mistry T, Ghosh S, Roy A, Bucha H, Mandal S, Nasare VD. Premalignant and malignant lesions of oral cavity in eastern India:

a hospital-based study. 2020 Eur J Cancer Prev Impact Factor-3.031 Belgium Ahead of print

Department of Immunoregulation and Immunodiagnostics

Head of the Department
Dr. Rathindranath Baral, PhD

Senior Scientific Officer (in Assistant Director Grade)

Team

Name	Designation
Prof. Swapna Chaudhuri	Emeritus Medical Scientist (ICMR)
Dr. Anamika Bose	Women Scientist A (DST)
Dr. Tapasi Das	Women Scientist (DHR)
Dr. Saptak Banerjee	Senior Scientific Officer II
Mr. Diptendu Ghosh	Senior Scientific Assistant
Students	
Mr. Avishek Bhuniya	Senior Research Fellow, CSIR-NET
Ms. Ipsita Guha	Senior Research Fellow, CNCI
Ms. Shayani Dasgupta	Senior Research Fellow, ICMR
Ms. Akata Saha	Senior Research Fellow, CSIR
Ms. Juhina Das	Senior Research Fellow, DBT-NET
Ms. Mohona Chakravarti	Senior Research Fellow, UGC-NET
Mr. Anirban Sarkar	Senior Research Fellow, UGC-NET
Ms. Sukanya Dhar	Junior Research Fellow, DST
Ms. Jasmine Sultana	Junior Research Fellow, CNCI
Mr. Saurav Bera	Junior Research Fellow, ICMR
Ms. Aishwarya Guha	Junior Research Fellow, CSIR-NET
Ms. Pritha Roychoudhuri	Junior Research Fellow, UGC-NET

Departmental Objectives

• To understand the molecular changes in intra-tumor and extra-tumor (systemic) immune functions in cancer host and to modulate altered immunity to obtain maximum anti-tumor benefits.

• To achieve this aim, immunomodulatory role of Neem Leaf Glycoprotein (NLGP) is extensively studied in different murine and human tumor models.

• To understand cancer associated regulation in the biology of pericytes, mesenchymal stem cells and cancer stem cells

• To understand differentiation of Th17 cells to Tregs under hypoxia- induced-VEGF within tumor microenvironment

• Understanding the metabolic regulation of Breast Cancer Stem Cells (BCSCs) and its impact on immune landscape

• Elucidating the role of tumor educated platelets in promoting EMT, metastasis and angiogenesis in breast cancer model: Modulation by 2DG/NLGP

Brief description of the work done

•Molecular alterations in various cell types, like, T cells, B cells, monocytes, macrophages, dendritic cells, regulatory T cells, myeloid derived suppressor cells in murine and human cancers are studied with special reference to its modulation by NLGP.

•NLGP mediated normalization of metastasis is studied in murine melanoma and carcinoma models.

•Role of non-hematopoietic stromal cells, e.g. pericytes and mesenchymal stem cells, in immune alteration, thereby, progression of cancer are studied in relation to NLGP.

•Influence of tumor-associated pericytes is investigated on CD4+ and CD8+ T cell functions.

•Molecular mechanism of downregulation of VEGF and HIF1a by NLGP in cancer cells is investigated in normoxic and hypoxic conditions.

•Significance of thymic atrophy in cancer and its modulation by NLGP, in relation to age associated thymic alterations, are under study.

•Role of RGS5 in differential apoptotic behaviour of tumor associated pericytes in tumor and non-tumor microenvironment is studied.

•Role of NLGP in intervening the initiation-promotion protocol during 4-nitroquinoline-1-oxide mediated tongue carcinogenesis, especially during epithelial mesenchymal transition are also being evaluated.

•Role of T cells in regulation of cancer stem cells under the immunomodulation of NLGP are under study.

•Molecular mechanisms of cancer progression in tumor hosts with type I/type II diabetes with reference to the alteration in cancer immune-surveillance and its correction by NLGP are being investigated.

•The role of tumor residing immunosuppressor cells in generation of multidrug resistance in murine and human lymphoma and immunomodulation by NLGP are under study.

•Influences of cardiovascular disease-linked statin (s) treatment on cancer immunoediting process and its modulation by NLGP.

•Studies on experimental and human oral carcinogenesis on formation of cancer stem cell niche

•Understanding the metabolic regulation of Breast cancer stem cells (BCSC) and its impact on immune landscape

•Role of HIF1α/VEGF in regulating cellular plasticity among Th17 and Treg in cancer

•Elucidation of the role of tumor instructed platelets on metastasis, angiogenesis and EMT

Extramural projects

1. **Elucidation of the immune rejuvenation of Hematopoietic stem and the progenitor cells by T11TS in glioma bearing rats**

Emeritus Medical Scientist

Prof. Swapna Choudhuri

Sponsor: **ICMR**

2. **Understanding the role of T cell subset(s) in regulation of cancer initiating stem like cells**

Principal Investigator

Dr. Anamika Bose

Sponsor: **DST-WOS**

3. **An attempt to characterize the protein and carbohydrate moieties of Neem Leaf Glycoprotein with special emphasis on structure-function relationship**

Principal Investigator

Dr. Tapasi Das

Sponsor: **DHR-ICMR**

4. **Understanding of the intra-extra-tumoral trafficking of mesenchymal stem cells and modulation of its immunosuppressive character by neem leaf glycoprotein**

Principal Investigator

Dr. Rathindranath Baral

Co-Investigator

Dr. Anamika Bose; Dr. Smarajit Pal

Sponsor: **ICMR**

Projects for students

Dr. Rathindranath Baral as PI

1. Studies on tumor induced thymic atrophy in mice in relation to T cell differentiation and death: Critical modulation by Neem Leaf Glycoprotein - by Ipsita Guha

Sponsor: CNCI

2. Analysis of tumor-induced regulator of G-protein Signalling 5 (RGS5) mediated alterations in tumor pericytes: Therapeutic modulation by Neem Leaf Glycoprotein- by Shayani Dasgupta

Sponsor: UGC

3. Regulator of G-Protein Signalling 5 (RGS5) Alters Pericytes' Functionality within Tumor Microenvironment- by Shayani Dasgupta

Sponsor: ICMR

4. Studies on the mechanism of Neem Leaf Glycoprotein (NLGP) mediated down-regulation of VEGF in tumors: Special emphasis on HIF degrading pathway- by Akata Saha

Sponsor: CNCI/CSIR

5. Intervention by neem leaf glycoprotein on the initiation-promotion protocol during 4-nitroquinoline-1-oxide mediated tongue carcinogenesis: Special emphasis on epithelial mesenchymal transition- by Juhina Das

Sponsor: DBT

6. Understanding the mechanism of cancer progression in tumor hosts with type I/type II diabetes with reference to alteration in cancer immune-surveillance: Correction by NLGP – Anirban Sarkar

Sponsor: UGC

7. Understanding the role of T cells in regulation of cancer stem cells: Influence of NLGP driven immunomodulation- by Mohona Chakravarti

Sponsor: UGC

8. Study of the role of tumor residing Immunosuppressor cells of the generation of multidrug resistance in murine lymphoma with the immunomodulation by Neem Leaf Glycoprotein- by Sukanya Dhar

Sponsor: DST

Dr. Saptak Banerjee as PI

1. Understanding the metabolic regulation of breast cancer stem cells and its impact on immune landscape – by Jasmine Sultana

Sponsor: CNCI

2. Elucidating the role of tumor educated platelets in promoting EMT, metastasis and angiogenesis in breast cancer model: Modulation by 2DG/NLGP – by Aishwarya Guha

Sponsor: CSIR

3. Understanding the influence of prolong Statin treatment in antigen presenting cells and its impact on cancer immunoediting process – by Pritha Roychoudhuri

Sponsor: UGC

Publications

1. Dasgupta S, Ghosh T, Dhar J, et al. TGFbeta in the tumor microenvironment antagonizes RGS5-induced proapoptotic signaling to promote pericyte-dependent tumor progression. *Cell Death and Differentiation* (Online ahead of print) doi: 10.1038/s41418-021-00801-3.
Impact Factor: 10.71

2. Sarkar M, Bhuniya A, Ghosh S, et al, NLGP salvages T cell functions from MDSC-suppression by altering IL-10/STAT3 axis in melanoma tumor microenvironment. *Melanoma Res, (*2021) 31(2):130-139. doi: 10.1097/CMR.0000000000000721.
Impact Factor: 2.62

3. Guha I, Bhuniya A, Shukla D, et al. Tumor arrests DN2 to DN3 pro-T cell transition and promotes its conversion to thymic dendritic cells by reciprocally regulating Notch1 and Ikaros signaling. *Front. Immunol*., 2020 11:898. doi: 10.3389/fimmu.2020.00898.
Impact Factor: 6.42

4. Guha I, Bhuniya A, Nandi P, et al. NLGP reverses tumor induced and age associated thymic involution to maintain peripheral CD8+ T cell pool. *Immunotherapy (2020)* 12(11):799-818. doi: 10.2217/imt-2019-0168.
Impact Factor: 3.02

5. Saha A, Nandi P, Dasgupta S, et al. Neem Leaf Glycoprotein restrains VEGF production by direct modulation of HIF1α-linked upstream and downstream cascades (2020) *Front Oncol (Cancer Molecular Targets and Therapeutics),*https://doi.org/10.3389/fonc.2020.00260.
Impact Factor: 4.3

6. Bhuniya A, Guha I, Ganguly N, et al. NLGP Attenuates Murine Melanoma and Carcinoma Metastasis by Modulating Cytotoxic $CD8^+$ T Cells (2020) *Front Oncol(Cancer Immunity and Immunotherapy)*, https://doi.org/10.3389/fonc.2020.00201.
Impact Factor: 4.3

7. Ghosh S, Juin SK, Nandi P, et al. PKCζ mediated anti-proliferative effect of C2 ceramide on neutralization of the tumor microenvironment and melanoma regression. *Cancer Immunol Immunother.* 2020, doi: 10.1007/s00262-020-02492-0.
Impact Factor: 4.8

Other academic activities

PhD awarded

1. Mr. Avishek Bhuniya has awarded Ph.D degree for his thesis, entitled, 'Studies on the Modulation of Metastasis in Mouse Melanoma and Carcinoma by Neem Leaf Glycoprotein: Involvement of the Immune System' from Calcutta University
2. Ms. Ipsita Guha has awarded Ph.D degree entitled, 'Studies on Tumor Induced Thymic Atrophy in Mice In Relation to Tcell Differentiation and Death: Critical Modulation by Neem Leaf Glycoprotein' from Jadavpur University

Thesis under preparation

Ms. Shayani Dasgupta, Ms. Akata Saha, and Ms. Juhina Das have been preparing their thesis for Ph.D degree at Calcutta University.

PhD ongoing

1. Proposed thesis work of Anirban Sarkar, Sukanya Dhar, Sourav Bera, Jesmine Sultana have been registered to Jadavpur University. Proposed thesis work of and Mohona Chakravarti, Pritha Roychoudhuri and Aishwarya Guha have been registered to Calcutta University under faculty of Zoology.

Teaching:

Dr. R. N. Baral was invited to act as a member of the Post Graduate studies in Physiology at Serampore College, Serampore, Calcutta University.

Dr. R. N. Baral was invited to act as an examiner of Ph.D thesis as well as viva voce examination of Calcutta University, Jadavpur University, Vidyasagar University, WB Health University, SP Pune University, Jawaharlal Nehru University.

Dr. Saptak Banerjee was invited to act as an examiner of PG Studies, Instrumentation Department, Jadavpur University.

Short Term Projects

No short term projects have been conducted in this year due to Covid-19 pandemic and Lockdown for couple of months.

Reviewer of Journals

Dr. Baral acted as an honorary reviewer of several international journals, like, Cancer Research, Int. J. Cancer, PLoS One, Vaccine, Int Immunopharmacol, Tumor Biology, J Cancer Research and Exptl Oncol, Biological Trace Element Research, Cytotherapy, Investigations, Cytotherapy, Immunotherapy, Toxicological Letters etc

Dr. Anamika Bose acted as an honorary reviewer of international journals, like, Blood, Melanoma Research, Stem Cell Research & Therapy, J Ethonopharmacology etc.

Reviewer of Projects

Dr. Baral acted as a reviewer of extramural projects submitted in CSIR, ICMR, DBT-Welcome Trust

Conference/Symposium/Workshop

Conference/Symposium/Workshop

Attendance in Conference/Symposium/Workshop was restricted in 2020-21 due to Covid-19 pandemic and Lockdown for couple of months. But, members are attended in various Webinar throughout the year.

Contribution in Covid pandemic

1. Bose A and Baral R, COVID-19 and NLGP: Lessons from Cancer Research (An opinion article): Communicated to Human Immunology (2021)

2. R. Baral was invited as a resource person in a Webinar on 'Covid-19 Pandemic: Our Survival and Vaccine', organized by Rotary Club of Murshidabad and Rotaract Club of Sripat Singh College, Murshidabad on 15.10.2020.

3. Mr. Diptendu Ghosh has been organized and conducted IgG antibody testing using ErbaLisa COVID-19 Kit.

Department of In Vitro Carcinogenesis and Cellular Chemotherapy

Team

Faculty

Dr. Madhumita Roy, PhD	Senior Scientific Officer (Assistant Director Grade) Head of the Department
Dr. Arpita Chandra, Ph D	Senior Scientific Officer-II
Dr. Subhasis Barik, Ph D	Senior Scientific Officer-II

Students

Ms. Kanisha Kar
Mr. Bikash Kabi
Mr. Soumyadeep Mukherjee
Ms. Puja Datta
Ms. Diya Ghosh

Objectives of the Department:

The department has multidisciplinary approaches to target cancer. The specific areas includes i) Identification of intra-thymic molecular mechanisms coupled with T-cell commitment from stem/progenitor - T cells to target their robust proliferation in T-cell leukemia/lymphoma, ii) Elucidation of the role heterotypic interactions of different immune suppressor cells in T cell tolerance in cancer condition. iii) Targeting cancer cells by application of different customized less toxic inorganic or organic molecules as chemotherapeutic agents iv) Development of drug delivery system that will deliver the existing drug to the targeted location by exploiting hypoxia.

Work done:

- Influence of Pattern Recognition Receptor (PRR) signalling in early thymopoiesis was checked in C57BL/6 murine model. Effects of sustained pro-inflammation induced by PRR activation was assessed on the trafficking, differentiation and activation dynamics of T cell progenitors.

- Novel cellular signatures associated with ETP-ALL were screened out from available literary evidences. In silico analyses were carried out to validate their efficacy as biomarkers. Expression of the biomarkers was correlated with the status of Notch signaling in ETP-ALL patients.

- Molecular perturbations associated with Notch signaling-mediated T-potency maintenance were assessed and integrated into a quantitative framework. Individual pathways exhibiting maximal alterations with changes in the qualitative as well as quantitative effect of Notch signaling were identified.

- Key microenvironmental signals governing the development and lineage determination of thymocytes and thymic stromal components were unravelled from a holistic screening. Preliminary idea about their crosstalk was established based on the patterns of their expression and activity.

- Regulatory factors associated with the development of oncogenic signatures during autoimmune inflammation were identified by a targeted in silico analysis. Construction of a hypothetical model was carried out based on their trends of up and downregulation. In-depth in silico analyses were performed

to pinpoint reliable predictive markers of the transformation of an autoimmune inflammation-stricken cell.

- A previously reported hydoxamic acid derivative was synthesized and characterized further. With this in Vitro cytotoxicity assay on different cancer cell lines (MCF- 7, MDA-MB 231 and A549) was performed and dose determination was done. Flow cytometry analysis was done with breast cancer cell lines using IC50 dose.

- The in vitro cytotoxicity study of a novel Cobalt Schiff base complex was evaluated in the human breast adenocarcinoma cell line lines (MCF-7 and MDA-MB231). Flow cytometry analysis in both of the cell lines with the respective IC50 dose.

- With same complex cancer cells were treated and the status of the protein involved in the signaling cascade of apoptosis was monitored using western blot analysis. All the experiments were validated in invivo murine breast adenocarcinoma model.

Projects Running:

(A) Extramural:

1. Project Title: "Environmental regulation on T cell development and autoimmunity." P.I.: Dr. Subhasis Barik,

   Funding agency: Department of Biotechnology (Ramalingaswami Fellowship).

2. Project Title: "Targeting the role of serum acute phase proteins to induce peripheral T cell tolerance in breast, ovary and colon carcinoma." P.I.: Dr. Subhasis Barik, Co-PI: Dr. Arpita Chandra and Dr. Soumitra Kumar Choudhuri.

   Funding agency: SERB-CRG (SCIENCE & ENGINEERING RESEARCH BOARD - CORE RESEARCH GRANT).

3. Project Title: "Cobalt Schiff base complexes as redox activated effectors in targeting lung cancer" P.I.: Dr. Arpita Chandra,

   Funding agency: DSTBT,WB

(B) Intramural:

1. Project Title: "Identification of intra-thymic mechanisms associated with T-cell commitment from T-stem/progenitor cells and robust T-cell proliferation in T-cell leukemia/lymphoma". P.I.: Dr. Subhasis Barik.
2. Project Title: "Targeting Breast Cancer Stem Cells through Chemotherapeutic Agents." P.I.: Dr. Arpita Chandra

(C) Students project running:

1. "Targeting multipotent nature of early T cell progenitors to inhibit their robust proliferation and lineage diversity: A Microenvironmental fine tuning over genetic mutations in Early Tcell precursor acute lymphoblastic leukemia (ETP-ALL)". PI: Dr. Subhasis Barik: Name of the Fellow: Mr. Soumyadeep Mukherjee (CSIR-JRF)

2. "Unraveling Chemotherapeutic efficacy of a Novel Cobalt Schiff Base Compound in both in vitro & in vivo." P.I.: Dr. Arpita Chandra ; Name of the Fellow: Kanisha Kar (UGC-JRF)

3. Project Title: "Repression of hypoxia induced angiogenesis by a hydroxamic acid derivative in Cancer " P.I.: Dr. Arpita Chandra; Name of the Fellow: Bikas Kabi (UGC-JRF)

Other academic activities:

A. Paper presented (Oral/Poster)/Attended in Seminar or conference:

- Dr. Subhasis Barik attended "40th Annual Conference of Indian Association for Cancer Research" on 1st March 2021, ILS, Bhubaneswar.
- Dr. Subhasis Barik Invited to deliver a lecture in Webinar named "Advance Computation and Biomedical Engineering "organized by Department of CSE, MAKAUT, West Bengal, India and the Webinar Organizing Committee of the MAKAUT University on 27th September 2020. The topic of the presentation was "T cell development and leukemia: A symbiosis between wet lab and dry lab".
- Dr. Arpita Chandra delivered an invited Lecture in the National level webinar on "Exploration of Insight in Innovative Research of Chemical Sciences in Modern Epoch", on 23rd January, 2021, in Krishna Chandra College on "Drug Resistance in Cancer".
- Dr. Arpita Chandra attended a national webinar on "Life with Covid: a step towards personal management" on 3rd August 2020, organized by Rammohan College, Kolkata.
- Dr. Arpita Chandra attended an International webinar on "Biology and human welfare" on 7th August 2020, organized by Rammohan College, Kolkata.
- Dr. Arpita Chandra attended "Rosalind Franklin Birth centenary lecture series" on 28th August 2020, organized by Rammohan College, Kolkata.
- Dr. Arpita Chandra attended an International webinar on "Mohandas K. Gandhi and Saraladevi Chaudhurani: Lost Letters and Women's History" on 3rd September 2020, organized by Shyamaprasad College, Kolkata.
- Dr. Arpita Chandra attended an International Webinar on "Chemistry at the Bio- Chemical Interface" on 29th and 30th August, 2020, organized by St. Paul's Cathedral Mission College, Kolkata
- Mr. Soumyadeep Mukherjee attended "40th Annual Conference of Indian Association for Cancer Research" on 1st March 2021, ILS, Bhubaneswar.
- Ms. Diya Ghosh attended a webinar on "Scientific Innovations over the Past Decade: an online initiative for Student Development" on 15th May, 2021 organized by Prabhu Jagatbandhu College, Howrah.

- Ms. Kanisha Kar attended a webinar on “Breakthrough in cell science” on 9th August, 2020 organized by Midnapore College Autonomous, Midnapore.
- Ms. Kanisha Kar attended in the online software demo on “Karyotyping and FISH” for CNCI on 13th April, 2021 organized by ZEISS Research Microscopy Solutions Carl Zeiss India(Bangalore) Pvt. Ltd. ZEISS Group.
- Mr. Bikash Kabi attended in the online work flow training session on “iThenticate : Plagiarism Detection Software” on 5th February, 2021 organized by the Library Committee of CNCI.

Department of Neuroendocrinology & Experimental Hematology

Team:

Head of the Department	Designation
Dr. Madhumita Roy	Senior Scientific Officer Grade□I (Assistant Director Grade)
Faculty	
Dr. Biswarup Basu	Senior Scientific Officer Grade□II
Students	
Mr. Sandip Ghosh, M.Sc	UGC-SRF
Mr. Souvik Das, M.Sc	UGC-JRF

Objectives of the Department: One of the objectives of this department is to understand dysregulations of neuronal-endocrine-immune axis in normal physiological processes which result into pathological manifestations like cancer and other diseases. This department also aims to evaluate preventive and therapeutic potential of natural compounds and efficacy of synthetic drugs for different cancers like breast and ovarian cancer. We are also engaged in development of affordable technologies and materials for better drug efficacy- drug delivery, immunotherapy and combinational therapy.

Students undergoing PhD: 3

Academic Projects: Projects running (Extramural) – None ;

Projects running (Intramural) –

- Combining efficacy of autophagy inhibitors and chemotherapy drugs in breast cancer
- Development and Preclinical Evaluation of Extracellular Matrix Mimicking Polymeric Scaffolds for Stimulated Scar-Free Healing of Burns and Radiation Wounds.
- Encapsulation of mesoporous Carbohydrate Nanoparticles on intestinal microflora cell surface for enhanced effectiveness of anticancer drugs
- Role of neuronal regulatory genes in cancer progression and Chemotherapy Induced Peripheral Neuropathy
- Evaluation of the therapeutic potential of Cuminaldehyde in ovarian cancer

C. Student's Ph.D projects:

1. "Study of autophagy signatures as prognostic biomarkers and therapeutic targets in Indian breast cancer patients"(Student: Mr. Sandip Ghosh)
2. " A study on molecular signatures and multiregional tumor heterogeneity in ovarian tumors in Eastern India and therapeutic targeting" (Student: Mr. Souvik Das)

Brief description of the work done during the year-

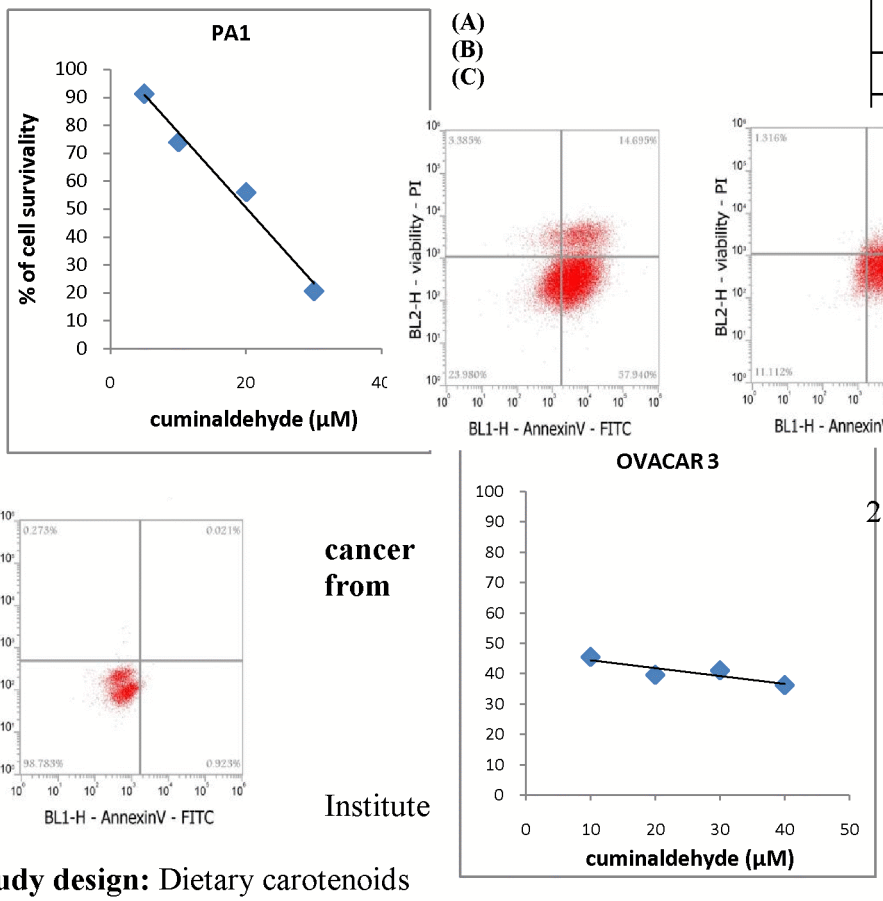
1. Evaluation of Cuminaldehyde as an anticancer agent in Ovarian cancer

Study design:

Cuminaldehyde (CuA), an oxidized aldehyde monoterpene, is a major essential oil component in Cumin and recently its anticancer effect been reported in lung and colon cancer. We've investigated its therapeutic as well as preventive role in ovarian cancer *in silico* and *in vitro*.For therapeutic purpose, less aggressive ovarian cancer cell line PA1 and aggressive/cisplatin resistance ovarian cancer cell line OVCAR-3 were treated with different concentrations of CuA and MTT assay carried out for cytotoxicity.Furthermore, molecular docking of CuA was conducted with active sites of shortlisted ovarian cancer target proteins, to understand inhibitory mechanism of CuA. *In Silico* Absorption , Distribution ,Metabolism, Excretion,organ toxicity prediction & drug likeliness of CuA were calculated using QikPro and ADMETSAR.Further CuA (IC_{50} concentration and sub IC_{50} conc) treated PA-1 cells were evaluated for apoptosis by Annexin-PI analysis with flow cytometry compared to vehicle treated control.

Key results:

Cuminaldehyde has shown cytotoxicity in both PA-1 (IC_{50} 20.15µM) and OVCAR-3 (IC_{50} 11.03µM) and exhibited apoptosis in ovarian cancer cells. Docking study suggested that anticancer activity may be mediated through PARP2 and mTOR.



Target Proteins	Docking Score (kcal/mole)
VEGFR 2	-4.7
	-5.8

Fig1. In vitro cytotoxicity of CuA in (A) PA-1 and (B) OVCAR-3 cells .(C)Molecular docking shows variable binding energy with ovarian cancer targets.(D) treatment of CuA in PA-1 cells showed cellular apoptosis in vehicle treatment, sub IC_{50} dose CuA treatment and IC_{50} dose CuA treatment (left to right) through flow cytometric analysis of Annexin-PI.

cancer from

Institute

2. Evaluation of anti breast efficacy of carotenoids oleaginous red yeast cultivated on waste hydrolysates

Collaboration: Amity University, Noida; Indian of Petroleum(CSIR–IIP),Dehradun

Study design: Dietary carotenoids are long been reported as chemopreventive to cancer. Experimental and epidemiological studies have indicated that carotenoids intake or serum level of carotenoids have inverse correlation with incidence of cancer.Our collaborator has demonstrated lab scale production of red yeast carotenoids using waste as feedstock and we were interested to evaluate its anti breast cancer therapeutic efficacy, if any.$1x10^3$ cells were plated per well in 96 well plate and *in vitro* cytotoxicity was evaluated (MTT

assay) for 48 hrs with breast cancer cell lines MCF7 and MDA-MB-231 against carotenoid extracts. AKT1, CASPASE3 and PARP-1 protein structures were preliminarily taken as breast cancer targets and molecular docking was performed on the optimized crystal structure with Schrodinger software against partially characterized components (β-carotene, Torularhodin,Torulene) from the extract.

Key results: Results showed that carotenoid compound have significant cytotoxicity in MCF7 (IC_{50} 29.11 µg/ml) and MDA-MB-231(IC_{50}7.82µg/ml).Binding energy metrics indicates that among all targets, AKT1 has shown highest binding energy with all the components followed by PARP and Caspase-3.

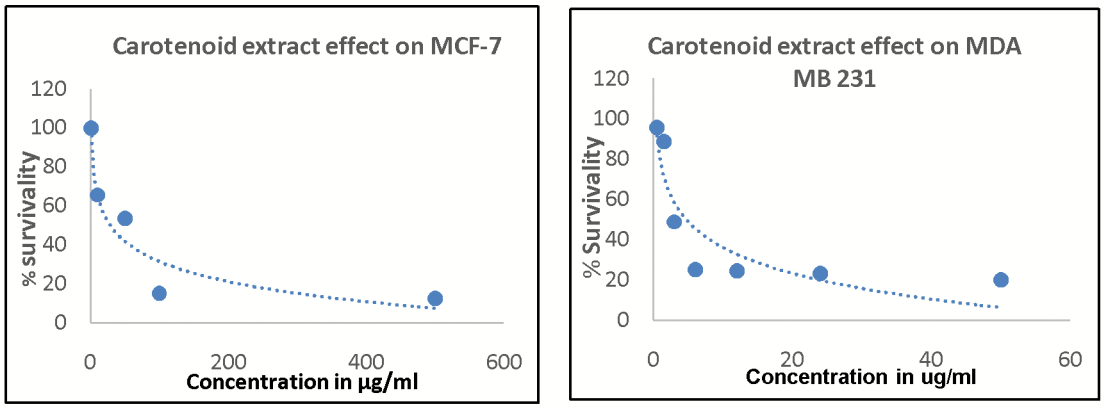
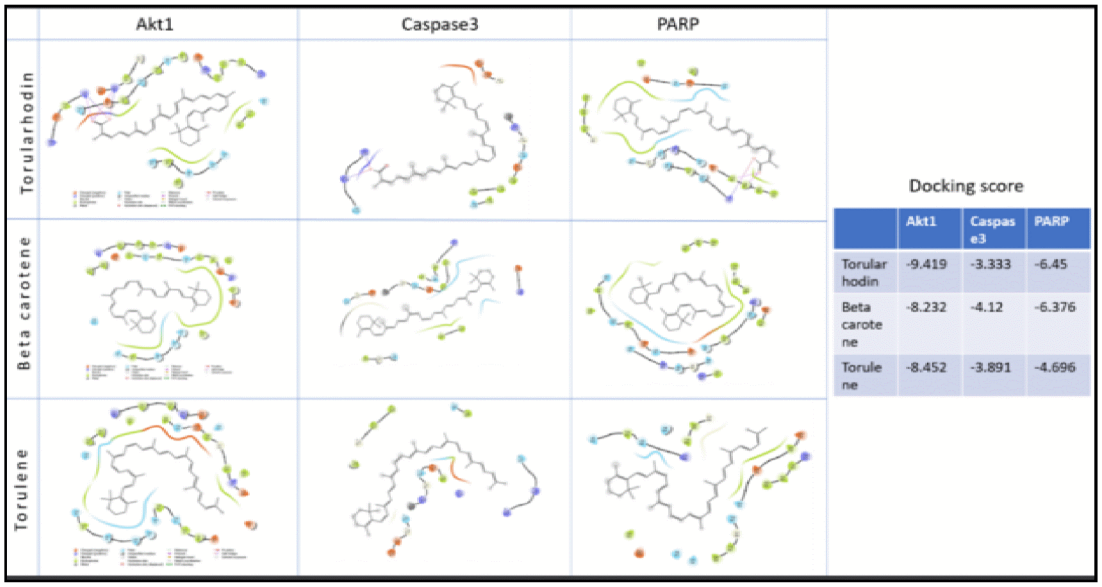


Fig2. Carotenoid extracts showing good cytotoxicity in MCF-7 (IC50 29.11 µg/ml) and MDA-MB-231(IC50 7.82 µg/ml) breast cancer cells. Results represent MTT assay data done in triplicate.



	Akt1	Caspase3	PARP
Torularhodin	-9.419	-3.333	-6.45
Beta carotene	-8.232	-4.12	-6.376
Torulene	-8.452	-3.891	-4.696

Docking result of partially characterized active components of carotenoids with breast cancer targets showed good binding energy with targets like AKT1> PARP > Caspase-3 (Binding energy (ΔG)= kcal/mol).

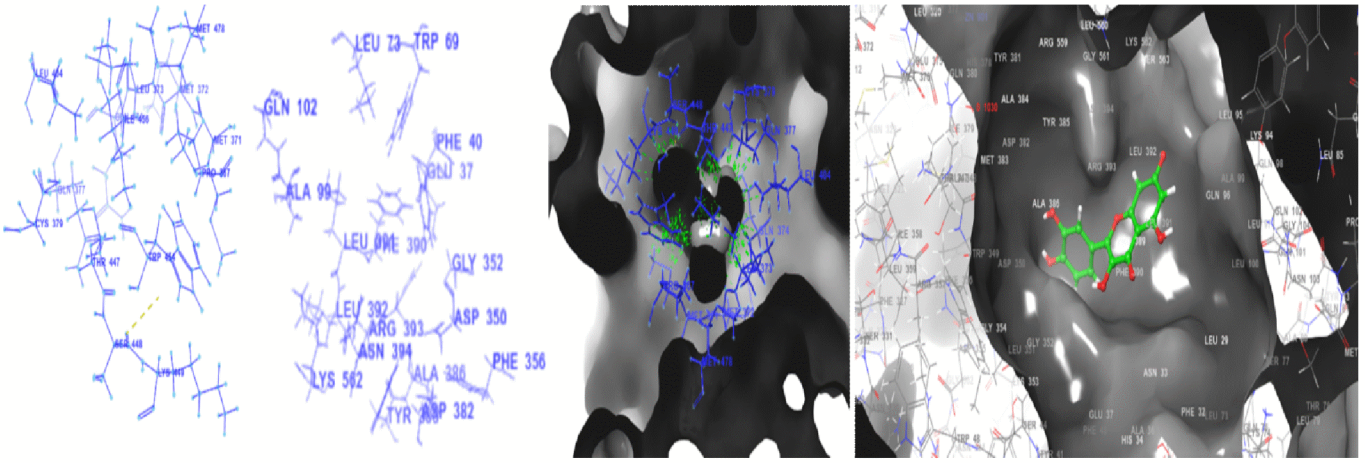
3.COVID-19 response: *In silico* virtual screening of natural compounds against ACE2/TMPRSS2 receptors as targets against different SARS-COV2 strains

Collaboration: Apeeay Stya University,Haryana; University of Pune,Pune

Study Design: ACE2 and TMPRSS2 are key receptors for SARS-COV2 entry into host cells and important druggable targets for virus entry blockers. Lack of *in vitro-in vivo* drug screening platform, biosafety facility and concerns in working with infectious virus are major bottlenecks in COVID-19 drug screening in India. As many phytochemicals were claimed to work against covid-19 disease, urgent need of the hour is to integrate Indian traditional medicinal knowledge (AYUSH medicines) to leverage

their clinical benefit against CoVID-19. We've virtually screened curated databases of Indian phytochemicals with medicinal value against these receptors so that findings from study can be utilised in any drug utility further. Virtual high throughput screening of more than 100 phytochemicals as inhibitors against different viral proteins including human ACE2 and TMPRSS2, and viral 3Cl protease has been carried out. Homology modelling of TMPRSS2, and 3Cl Pro was initially done and molecular docking were carried out with the phytochemicals as ligands to examine the binding affinity of various phytopharmaceuticals.

Key results: Several non-toxic phytopharmaceutical molecules were identified that bind to important protease active site(s), and may be further used as antiviral molecules against COVID-19. phytopharmaceutical compounds showing best binding affinity [Carvacrol, (-6.34), Guaijaverin (-7.8) & Quercetin (-6.6)] with the respective proteases will be subjected to MD simulations studies to help us understand the stability of ligand binding and monitoring the behavior of molecules.



(a) (b) (c) (d)

Fig 3. Three-dimensional structure focusing on the TMPRSS2 (a) and ACE2 (b) active sites. The substrates with best docking score, Carvacrol from Ajwain, Corum, (c, in blue color) and Quercetin from Ashwagandha (d, in Green color) is shown bound to the active site of TMPRSS2, and ACE2 respectively, from left to right.

4. Nanoparticle mediated drug delivery in drug resistant breast cancer cells

Collaboration: CSIR-CMERI, Durgapur

Key Results: A novel approach used to synthesize antimetabolite-conjugated and intense blue fluorescence-emitting smart polymeric nanoparticles is reported for the efficient delivery of anticancer drugs and self monitoring their effect in drug-resistant metastatic breast cancer cells. To prepare the drug-loaded fluorescent nanoparticles, the FDA-approved non-fluorescent poly(D,L-lactide-co-glycolide) (PLGA) polymer was modified into a newly designed fluorescent PLGA polymer by the covalent conjugation of the biocompatible fluorophore 1-pyrenebutyric acid (PBA). The fluorescent PLGA–PBA polymer was then electrosprayed by applying a potential of 8.0 kV to synthesize mono-dispersed spherical fluorescent nanoparticles (size B40 nm). The surface of the PLGA–PBA nanoparticles was conjugated with the potent anticancer drug molecule methotrexate (MTX) through a linker molecule, ethylenediamine (EDA), to kill cancer cells. The fluorescence, FTIR, NMR, and mass spectroscopy results of PLGA–PBA and PLGA–PBA@MTX nanoparticles provided proof of the successful synthesis of PBA and MTX-conjugated nanoparticles with stable fluorescence for monitoring the *in vitro* therapeutic effect. A significant internalization of the PLGA–PBA@MTX nanoparticles was observed inside MTXresistant MDA-MB-231 and MCF-7 cells predominantly via micropinocytosis. Since MTX is an analog of folic acid and encourages cell internalization through the FRα receptor, a higher population of PLGA–PBA@MTX nanoparticles was observed in MDA-MB-231 cells with higher cell cytotoxicity than in MCF-7 cells. The amide bond, which links the MTX molecules to the surface of the fluorescent PLGA–PBA nanoparticles, was found to be sensitive to acidic pH. The controlled release of MTX occurred at pH 6.0 for ~6 days due to the acid-catalyzed amide bond hydrolysis. The lower IC_{50} value justified a high MTX loading (36%) with significant conjugation efficiency (91.4%), and a rapid drug release in acidic medium compared to that of the free MTX molecule and high apoptosis in the nanoparticle-treated cells were observed.

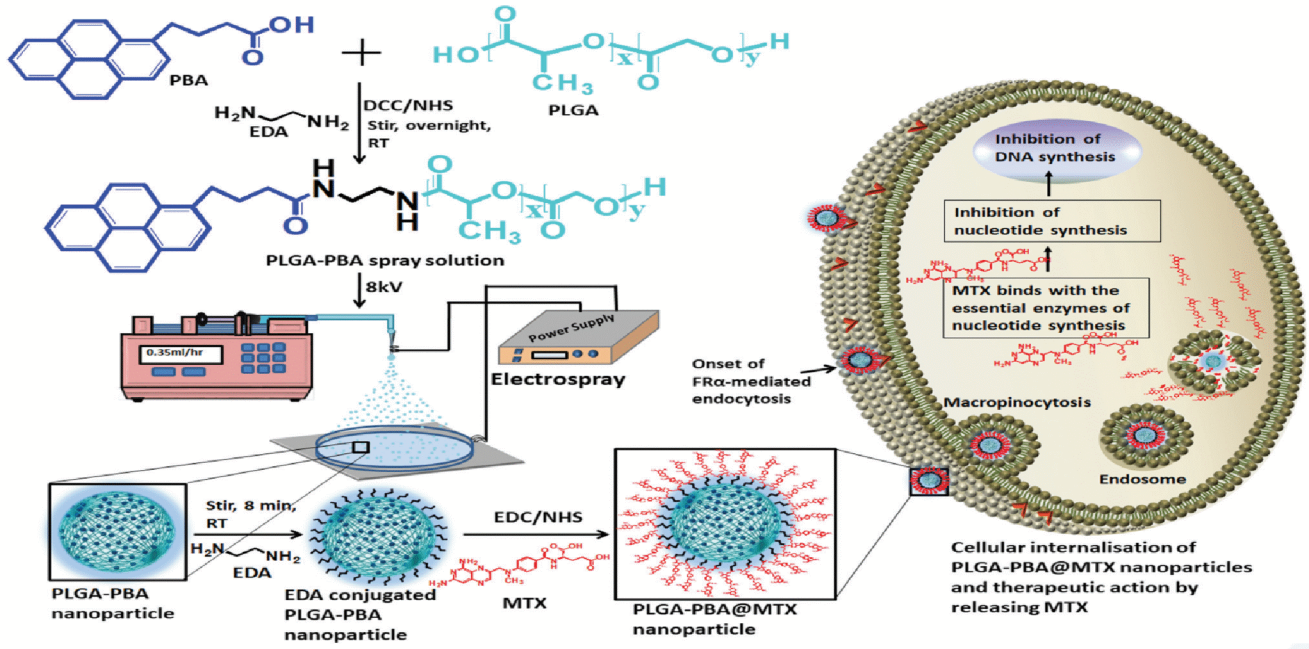


Fig 4. Schematic representation of the PLGA–PBA nanoparticle synthesis from the PBA-modified PLGA polymer and the subsequent preparation of PLGA–PBA@MTX nanoparticles to demonstrate the therapeutic action by releasing MTX after intracellular delivery

Publications:

1. Chatterjee M, Maity R, Das S, Mahata N, **Basu B***, Chanda N*. Electrospray based fluorescent nanoparticle synthesis from pyrene butyric acid-functionalized poly (D,L-lactide-coglycolide) polymer for the efficient delivery of anticancer drug and self monitoring its effect in the drug-resistant breast cancer cells. ***Materials Advances, 1 (8), 3033-3048***
2. Suresh S, Das S, Waidha K, Maity R, **Basu B***, Saravanakumar R*. Multi□Component Approach for Synthesis of Quinolinyl□1, 4□dihydropyridines, Evaluation of Cytotoxicity against MCF7 and Molecular Docking Studies. ***Chemistry Select, 5 (34), 10501-10510***
3. J Devi*, J Yadav, D Kumar, DK Jindal, **Basu B.** Synthesis, spectral analysis and in vitro cytotoxicity of diorganotin (IV) complexes derived from Indole □3□butyric hydrazide. ***Applied Organometallic Chemistry,34(10), e5815***

Other academic activities:

Dr. Basu attended the followings-

1. Training course attended:
   (i) iThenticate: Plagiarism Detection Software training: 5th Feb, 2020
   (ii) Good Clinical Practices (Virtual) training: 16th January, 2021
2. Workshop attended: Young Scientist Conclave -IISF 2020 (Virtual, 22nd -24th Dec, 2020)
3. Conferences attended:
   (i) 40th Annual Conference of Indian Association For Cancer Research: 1st March, 2021
   (ii) 13th Young Investigator's Meeting(Indiabioscience): 17th March- 19th March,2021

1. Seminars/Webinars attended:

(i) Flow Cytometry Data Analysis Using FCS Express Software : 26th March, 2021
(ii) FIGO Global Webinar: Ovarian Cancer:17th March , 2021
(iii) Scientific and Ethical Standards of Clinical Trials in Public Health Emergencies :24th Sep, 2020
(iv) Virtual Briefing: Release of the AACR Cancer Progress Report 2020: 23rd Sep, 2020
(v) DBT - NIH Webinar - Challenges in Conducting Human Challenge Studies: Policy Perspectives from India and United States: 22nd Oct, 2020

Other awards or academic achievements:

(i) Dr. Basu acted as reviewer in reputed publication houses (Elsevier, Springer Nature).
(ii) Dr. Basu enrolled as Ph.D supervisor at Jadavpur University (Life Science & Biotechnology).
(iii) Mr. Sandip Ghosh is recommended to pursue as Senior Research Fellow by institutional committee.

DEPARTMENT OF ONCOGENE REGULATION

Head of the department:

Dr. Jayanta Chakrabarti, MS; DNB
Director

Scientific Faculty:

Dr. Sankhadeep Dutta, Ph.D
Senior Scientific Officer, Grade-II

Dr. Santosh Kumar Guru, Ph.D
Senior Scientific Officer, Grade-II (till February, 2021)

Dr. Chinmay Kumar Panda, Ph.D., FNASc, FAScT
NASI Senior Scientist Platinum Jubilee Fellow

Prof. Bishnu Pada Chatterjee, Ph.D, FAScT, FNASc, FAMS
Distinguished Honorary Scientist

Woman Scientist

Dr. Anindita Ghosh, Woman Scientist-A, DST

Research Associate

Dr. Debolina Pal, NASI
Dr. Md. Saimul Islam, ICMR
Dr. Gangotree Mohanty, CSIR

Senior Research Fellow

Mr. Anirban Roy Choudhary, ICMR
Ms. Rituparna Roy, CNCI
Ms Mukta Basu, UGC-NET
Mr. Balarko Chakrobarty, UGC-NET
Ms. Debalina Mukhopadhyay, Woman Scientist, DST
Ms. Priyanka Dutta, DST-INSPIRE

Junior Research Fellow

Ms. Farhin Sultana, CSIR- NET
Ms. Essha Chatterjee, UGC- NET
Mr. Biswajit Dey, UGC- NET
Ms. Debdatta Talukdar, UGC- NET

Project Assistant

Ms. Nilanjana Chatterjee, IARC-WHO

Objectives:

The objectives of this department are to understand the molecular pathogenesis of tumor development, to develop of techniques for early detection of tumor and to develop precise therapeutic strategies of tumor. Our study has been focussed on the following aspects: 1) Molecular analysis of some epithelial malignancies to understand molecular pathogenesis of the disease, 2) Development of non-invasive biomarkers for early detection of carcinomas in Head and neck, cervix and liver, 3) Molecular mechanism of tumor dormancy for proper therapeutic intervention and 4) Evaluation of anti-tumor activities of some indigenous medicinal plant derived phytochemicals.

Works done:

Projects running:

Project-1: Molecular analysis of some epithelial malignancies:

I. Alterations of sonic-hedgehog self renewal pathway during development of head and neck squamous cell carcinoma (HNSCC)

The study was aimed to understand the importance of the hedgehog signalling pathway in development of head and neck squamous cell carcinoma (HNSCC). For this reason, molecular profiles (expression/ CNV/ methylation) of the key regulatory genes of the pathway like PTCH1 (PTCH1-1/1A/1B), SHH, SMO, GLI1 and HHIP were analyzed in the adjacent normal epithelium at first, followed by the changes during development of the tumor along with association with different clinico-pathological parameters including tobacco habit and HPV infection. High/medium protein expression of PTCH1, 1B together with GLI1, SHH and SMO were observed in basal-parabasal layers of adjacent normal epithelium than the spinous layers, unlike high/medium expression of HHIP throughout the epithelium. During progression of the tumor significant down regulation of HHIP protein was evident along with enhanced expression of the other proteins. This was validated by mRNA expression analysis of the genes coupled with reduced expression of PTCH-1 isoform in the tumors. Differential methylation of proximal and distal promoters of PTCH1 concordant with its mRNA expression was seen in the samples. Frequent promoter methylation than deletion of HHIP was seen in the tumors along with high reduced expression of the HHIP mRNA stabilizer HHIP-AS1 RNA. Alterations (deletion/methylation) of HHIP showed significant association with HPV infection in the tumors. The patients with under expression of HHIP, HHIP-AS1 and high expression of GLI1, and HPV + tobacco+ status showed poor patient outcome. Thus, differential expression of PTCH1 isoforms and frequent inactivation of HHIP are the key regulatory events of hedgehog pathway activation in HNSCC.

II. Down regulation of Protein Tyrosine Phosphatase Receptor Type J (PTPRJ) in cervical carcinoma of Indian patients.

Cervical carcinoma (CACX) is one of the leading causes of deaths in Indian women. Here, we analyzed the molecular status of Protein Tyrosine Phosphatase Receptor Type J (PTPRJ) in CACX of Indian patients (n=155). PTPRJ showed frequent down-regulation in cancer samples (n=31) at the transcriptional level. Immunohistochemistry revealed concordant low expression of PTPRJ protein with few samples showed intermediate expression. To probe for the cause of such down regulation of the gene in CACX we analyzed the copy number and promoter methylation of PTPRJ. The genetic locus of PTPRJ showed comparatively low frequency of deletion (14.8%) than promoter methylation (33.5%). The present study paves the way for

further research into the plausible mechanisms of frequent down-regulation of PTPRJ in CACX apart from deletion and promoter methylation.

III. Differential prevalence of G-Quadruplex tertiary DNA structure in WNT/EGFR pathway genes in chemotolerant triple negative breast cancer (TNBC): clinico-pathological importance

The aim of the study is to understand the involvement of G-Quadruplex (G-Q) structures in altering the expression profile of WNT/EGFR pathway genes in chemo-tolerant TNBC samples. At first, GEO datasets were mined where expression profile of WNT/EGFR pathway genes in TNBC samples and MDA-MB-231, a TNBC cell line, were checked in response to anti-cancer drug doxorubicin. It was found that expression of the receptors (FZD7, LRP6 and EGFR) and antagonists (SFRP1, SFRP2 and SH3GL2) of the WNT/EGFR pathway were differentially expressed in chemo-tolerant TNBC; further emphasised in our sample pool (n= 61). To unveil the probable mechanism of regulation, presence of G-Q structure was checked in in-silico study. Notably, these G-Q tertiary DNA structures were found in the WNT pathway genes, proximal to transcriptional start sites (-2000bp to +450bp). Further verifying in our patient sample pool, a significant increase in G-Q prevalence was found in neo-adjuvant chemotherapy treated (NACT) TNBC samples (n=17) than the pre-therapeutic samples (n=44). Similar pattern of G-Q prevalence was observed in doxorubicin treated MDA-MB-231 cell line. Intriguingly, low staining of G-Q among the pre-therapeutic TNBC samples than the NACT samples, was found to be significantly correlated with lymph node metastasis. Thus, our study showed that the differential prevalence of G-Q structure might have important role in regulating the expression of agonists and antagonist of the WNT/EGFR pathway genes in response to doxorubicin treatment of TNBC.

IV. Analysis of molecular stress associated LIMD1-VHL-HIF1α pathway in the development of bladder carcinoma: association with arsenic prevalence

Our study was aimed to understand the importance of LIMD1-VHL-HIF1α pathway in development of bladder carcinoma (BlCa) in association of arsenic prevalence. At first, the mRNA expression pattern of the genes of this pathway (LIMD1, VHL and HIF1α) was checked in GEO datasets and in our samples. Next, genetic and epigenetic profiling of LIMD1 and VHL were done in our sample pool, validated in T24 BlCa cell line. The results were next correlated with various clinicopathological parameters. Differential under expression of LIMD1 and VHL genes was found in muscle invasive BlCa (MIBC) in comparison to non-muscle invasive BlCa (NMIBC). However, HIF1α protein, but mRNA, was found to be over expressed among the MIBC samples; depicting the probability of HIF1α protein stabilization. Analysis of genetic and epigenetic profiles of LIMD1 and VHL exposed a frequent promoter methylation of LIMD1 gene in MIBC samples. Further, in-depth look into the results unveiled that the high nuclear expression of HIF1α was significantly correlated with genetic alterations of LIMD1 alone or in combination with VHL. Moreover, treating the T24 cells with a de-methylating agent (5-aza-2'-deoxycytidine) re-expressed the methylated LIMD1 and VHL genes, which in turn, reduced the HIF1α protein level significantly. Additionally, patients with high arsenic content (>112ng/g, AsH) seemed to have recurrent promoter methylation in LIMD1, as well as co-methylation/alteration of LIMD1 and VHL gene. Lastly, high nuclear expression of HIF1α in association with co-alteration of VHL and LIMD1 showed the worst overall survival (OS) among the patients. To conclude, MIBC samples portrayed higher alterations in VHL and LIMD1, thereby, stabilizing HIF1α protein and lowering the OS of patients.

V. Comparative evaluation of prevalence and clearance of HPV in cervical smear of women with or without cervical lesions

High risk human papillomavirus (HPV) is an important factor during the development and recurrence of cervical cancer (CACX). But prevalence and clearance of HPV during development from asymptomatic cervical smear to CACX is not clear. This study aimed to evaluate the prevalence and clearance of HPV during the development of cervical lesions i.e., from asymptomatic to cervical lesions at different clinical stages. A total of 248 women (30 and 60 years of age) with/without cervical lesions were screened both from population-based Hybrid Capture 2 study and hospital section of CNCI. HPV DNA was detected from cervical scrapes by nested polymerase chain reaction. Detection of HPV 16/18 was carried out by polymerase chain reaction using type-specific primers. Viral load was determined by absolute real-time polymerase chain reaction. HPV prevalence was comparatively low in asymptomatic samples (32.5%) than LSIL (52.9%) and HSIL (71.4%). During follow up visit of women, HPV clearance rate was seen to be highest (67.5%) in asymptomatic women followed by gradual decrease towards LSIL (47.1%) and HSIL (28.6%) respectively. Here, the prevalence of HSIL was significantly higher in women infected with HPV16. A gradual increase in HPV copy numbers during first visit and follow up were associated with progressive cytological severity. Thus, our study showed gradual decrease in HPV clearance with progression of cervical lesions indicating its importance in diagnosis and prognosis of the disease.

VI. Determination of prevalence of novel Gamma-HPV types 223 and 225

High risk Human papillomaviruses (HR-HPV) belonging to Genus-Alpha are the necessary cause for cervical cancer, oral cancer, anogenital cancer etc. Beside the Alpha types, cutaneous Beta and Gamma HPV mostly infects keratinic epithelium of skin. However, few recent studies on beta and gamma HPV prevalence reported their presence in muco-cutaneous areas of anogenital, oral and nasal cavity along with external skin, indicating broader tissue tropism. A considerable amount of heterogeneity present in the L1 open reading frame of the beta and gamma HPV genomes are indicative of the plausibility of many unknown HPV types/ sub-types, yet to be discovered. With the advancement of high-throughput DNA sequencing techniques many novel HPV genomes have been discovered in last few years. As example, two novel Gamma HPV types 223 and 225 have been discovered, fully cloned and characterized in 2018, however, the prevalence pattern and tissue tropism were not evaluated. To this effort, the prevalence of these two novel HPV types were evaluated in clinical and sub-clinical samples of various anatomical sites collected from female participants (N=38) attending the ENT-Out Patient Department or, the Gynecological Oncology-Out Patient Department of CNCI, Kolkata, India between November 2019 to March 2021. Among 38 participants, 16 were asymptomatic, 18 were having dysplasia in their oral cavity/cervix and the rest 04 were oral/cervical Cancer patients. Swab samples from the sun-exposed skin from forehead and forearms, Breast skin and Oral gargle were collected from each participant. Similarly, clinical and sub-clinical samples were collected from male participants (N=04) attending and ENT-Out Patient Department of CNCI, Kolkata between November 2019 to March 2021. Among 04 participants, 03 were asymptomatic and only one participant had neoplastic lesion in their oral cavity. Swab samples from the sun-exposed part of skin, and Oral gargle were collected from each participant as described above. All participants were between 18-57 years age group. Written informed consent was taken from each individual before collecting samples. Following

genomic DNA isolation and ascertaining the integrity of genomic DNA, the samples were screened for the presence of HPV 223 and 225 DNA by PCR using type specific primers.

The HPV 223 prevalence was screened in 38 female participants (38/110) where the prevalence was found only in Oral gargle of asymptomatic (n=3/16, 18.7%) and dysplastic (n=7/18, 38.9%) participants but not found in any cancer patient (n=0/4). Interestingly, HPV 223 prevalence was not found in DNA samples collected from breast skin or sun exposed skins of these participants. On the other hand, the DNA samples from male asymptomatic (n=0/3) or cancer (n=0/1) participants showed no prevalence of HPV 223.

The same cohort of female participants (n=38) when screened for HPV 225, the prevalence was found only in skin DNA samples of asymptomatic females (Breast skin: n=4/16, 25%; Sun exposed skin: n=7/16, 43.8%) and dysplastic female participants (Breast skin: n=7/18, 38.9%; Sun exposed skin: n= 5/18, 27.8%). However, no female cancer patient (n=0/4) showed the presence of HPV225 so far. Among the HPV225 positive asymptomatic/ dysplastic participants (14/34), majority (9/14) had the prevalence of the virus on both their sun exposed skin and Breast skin. Only a small number of participants contained the virus either on their sun exposed skin (3/34) or Breast skin (2/34). On contrary to the prevalence of HPV223, no prevalence of HPV 225 was found in any oral gargle samples (0/38). On the other hand, DNA samples from only four male participants were screened so far, however, no prevalence of HPV 225 was found (n=0/4).

It is noteworthy to mention that those participants positive for HPV 223 were not found to be positive for HPV 225, or vice versa. Hence, there is no incidence of coinfection in these 42 samples which are being initially screened. Furthermore, a bigger cohort with adequate number of male and female participants shall be screened to ascertain the specific tissue tropism of these two viruses.

Project-2: Development of non-invasive biomarker for early detection of carcinomas in Head and neck, cervix and liver

I. Identification of deregulated microRNA in plasma as non-invasive biomarkers for early detection of Head and Neck Squamous Cell Carcinoma in Indian patients

Indian subcontinent contributes two third of the global Head and Neck Squamous Cell Carcinoma (HNSCC) burden. While prevalence of High Risk-Human Papillomavirus (HR-HPV) is varied (9.2-74%), other etiological factors like use of tobacco and betel nuts contribute to HNSCC development. Unfortunately, the HNSCC patients are often diagnosed at late stage in our country, whereas, the treatment modalities are still primarily based on classical histological grade and stage predicting indices. In such scenario, post-treatment recurrence rate is high. To this effect, continuous effort in developing blood plasma based non-invasive biomarkers to aid early diagnoses and prognoses of the disease are evidenced. In this study, we aim to (i) investigate the altered expression of HPV-core miRNAs and metastamirs in plasma of HNSCC patients, and (ii) to decipher the underlying mechanisms contributing to such miRNA deregulation during HNSCC development/recurrence and (iii) Clinicopathological correlations of these biomarkers with HNSCC patients at different clinical stages.

To this effort, freshly operated head and neck lesions (n=30), adjacent normal tissue of the lesions and 5ml blood of the respective patients were collected from the hospital section of the Chittaranjan National Cancer Institute, Kolkata after obtaining appropriate approval from Institutional Ethical Committee and informed consent from the participants.

Additionally, Oral swab and 5ml of blood were collected from 10 healthy normal individuals voluntarily participated in this study. The plasma was isolated from the blood samples and stored in -80ºC deep-freezer until further use. The tissue samples were frozen immediately after collection at -80ºC until use. Part of the tissue was directly collected in TRIzol reagent for RNA isolation. The demographic details of the patients were collected personally by questioning the patients according to the norms of the institutional review board; however, the clinical data were collected from the hospital records.

Following genomic DNA isolation and ascertaining the integrity of genomic DNA, the samples were screened for the presence of HR HPV DNA by PCR using MY09/11 degenerate primers from the L1 consensus region of the HPV genome. In all the cases, HPV 16 and HPV 18 plasmids were used as positive controls. HPV prevalence was seen in one of the 10 normal oral swabs and 40.0% (12/30) of tumor samples.

Following HPV detection, total RNA was isolated from other half of these HNSCC primary tumor (n=12) and corresponding adjacent normal tissues (n=12) using TRIzol reagent according to manufacturer's protocol. Moreover, to isolate total RNA from the corresponding blood plasma (n=12) of the HR HPV positive HNSCC patients the frozen plasma samples were thawed and isolation was performed using NucleoSpin RNA/Protein isolation kit (MACHEREY-NAGEL, Germany), according to manufacturer's protocol.

Following isolation, purity of the RNA was checked spectrophotometrically from A260/280 ratio and concentration was determined from A260 value. To ascertain the integrity, 2µg of the isolated RNA samples were run on a 1.5% denaturing agarose gel, stained with ethidium bromide and checked under ultraviolet light to visualize 28S and 18S rRNA bands.

The samples with good RNA quality were processed for miRNA expression analysis by Next Generation Sequencing (NGS). Furthermore, cDNA will be prepared with 5 µg of total RNA, enriching the miRNA specific cDNA fraction, for validation of the miRNA expression showing alterations in NGS analysis. The RNA samples from HR HPV+ve and HPV-ve tumor tissues (n=6) along with their adjacent normal tissues (n=6) and blood plasma samples (n=6) are being analyzed for comparative miRNA expression profile by NGS. For this, small RNA libraries are being prepared for sequencing on Illumina HiSeq platform (Illumina, Inc., USA) using 75 Single End (75SE) chemistry to generate approx. 10 million SE reads/sample. The work is in progress at present.

On analysis of the primary reads using suitable Bioinformatics / statistical tool will lead us to identify the deregulated miRNAs, their downstream targets and pathways altered in the clinical samples.

II. Evaluation of LIMD1-VHL targeting miRNA(s) as biomarker in Uterine Cervical Carcinogenesis

Cervical cancer (CACX) is the 4th largest malignant tumor types in women world-wide and also ranking 4th in the cancer related death of women each year. Now -a-days, miRNA plays an important role by promoting cancer progression where they act either as an oncogene or as a tumor suppressor gene by regulating their target gene expression mostly pairing with complementary nucleotide sequence at the 3' UTR region of its target gene. Deregulation of two key genes, viz. LIMD1 and VHL are associated with the development of cervical cancer via their ability to regulate HIF-1α expression. Through

in silico analysis, we have identified four LIMD1-VHL targeting miRNAs: miR-135b-5p and miR-24-3p for LIMD1 and miR-21-5p and miR-590-5p for VHL. Here, we aim to analyze the expression profile of LIMD1, VHL and their targeting miRNAs both in cervical cancer and normal tissue sample as well as in cervical swab samples with a future perspective for using these miRNAs as a biomarker in self-collected cervical specimen. To this effort, a total of 75 tissue samples [Primary biopsy tissues, n=50 and FFPE samples, n=25] were collected from the Gynecological oncology OPD of CNCI, Kolkata with proper institutional ethical consent. Among these 50 primary biopsy samples, 4 were unrelated normal tissues, 3 premalignant cervical intraepithelial neoplasia III (CINIII) samples, 28 were stage I/II tumors and 15 were stage III/IV tumors. On the other hand, among the 25 FFPE tissue blocks, 10 contained normal cervical tissues and 5 were CINII and 10 were CINIII.

Following the microdissection and tumor cell enrichment, genomic DNA was isolated. A subset of these samples was then screened for presence of HR HPV DNA by polymerase chain reaction (PCR) using MY09/11 primer, followed by HPV 16/18 typing using the HPV type specific primers. All the 25 CACX tumor samples were HR HPV positive (n=25/25, 100%). Among them, 21 samples (n=20/25, 80%) were positive for HPV16, 3 were positive for HPV18 (n=3/25, 12%) and 2 CACX tumor samples were co-infected by both with HPV16 and HPV18 (n=2/25, 8%). Among 3 CIN samples, 2 were HPV16 positive (n=2/3, 66.6%) and 1 was HPV negative. On the other hand, 2 unrelated normal cervical tissue samples were HPV negative (n=0/2).

Thereafter, to determine the expression pattern of the two key miRNAs targeting LIMD1 and VHL, total RNA was isolated and the small-RNA fragments were retro-transcribed from 4 CACX sample and 2 unrelated normal cervical tissues. The analyses of expression of LIMD1 and its targeting miRNA (miR-135b-5p) as well as VHL targeting miRNA (miR-21-5p) were analyzed by quantitative real-time PCR showed: The expression of LIMD1 was 3.54-fold lower in CACX sample in comparison to normal cervical tissue sample. In contrary, the LIMD1 targeting miRNA i.e, miR-135b-5p expression was 1.82-fold higher in CACX sample in comparison to normal cervical sample.

To correlate the mRNA expression pattern of LIMD1 with its protein expression, immunohistochemical analysis was done in CACX (n=5), CIN (n=5) as well as in normal cervical tissue samples (n=5). According to Perrone et.al., 2006 scoring, high/medium nuclear/cytoplasmic expression of LIMD1 in basal-parabasal layers of normal cervical epithelium was seen in 80% (4 out of 5) samples followed by 100% (5 out of 5) sample in spinous layer. Whereas lowered expression of LIMD1 was observed in 60 % (3 out of 5) of CIN and 80% (4 out of 5) of CACX sample. So, the preliminary data of immunohistochemistry suggests gradual decrease in the expression of LIMD1 protein with the development of CACX. Presently, real time and immunohistochemical analysis are being done in order to study the mRNA and protein level expression pattern of VHL in cervical tissue sample.

III. Development of non-invasive biomarker for prediction of liver lesions at different clinical stages

The aim of this study is to develop plasmonic ELISA from serum phosphoprotein(s) of patients having chronic hepatitis B (CHB); HBV related liver cirrhosis (HBV-LC) and hepatocellular carcinoma (HCC) for early prediction of the disease. Eight serine-phosphorylated protein bands of different intensities were identified around at 25, 30,45, 50, 56, 60, 80 and 122 kD, respectively, by Western blot analysis. Of them, 122 kDa protein was only highly expressed in HCC samples than other patients' samples indicating its greater importance in early diagnosis of HCC. In case of phosphothreonine protein two bands around 55 kDa and 25 kDa showed remarkable increase in expression in HCC samples compared to others. In ELISA, the level of phosphoserine proteins was significantly higher in HCC patients than control groups ($p<0.012$). Similarly, phosphothreonine proteins level was also significantly higher in HCC patients than control group ($p<0.005$). The detailed analysis of the phosphoproteins is underway to find out the novel phosphoproteins as biomarker.

(*This is a collaborative project with the Depts. of Hepatology, Gastroenterology and Pulmonary Medicine of Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh*)

Project-3: Molecular mechanism of tumor dormancy for proper therapeutic intervention

Cancer drugs typically produce short-lived clinical remissions due to acquired drug resistance, which can be spontaneously reversible over time. Exposure to high doses of anticancer drugs can induce the emergence of a subpopulation of weakly proliferative and drug-tolerant cells/persister cells, which display markers associated with stem cell–like cancer cells. After a period of time, some of the surviving cells were observed to change their phenotype to resume normal proliferation and eventually repopulate the sample. These the drug-tolerant cells could be drug resensitized following drug washout.

The cyclin-dependent-kinase9 (CDK9) is amongst the most frequently and spontaneously mutated genes in high-grade cancers. Unlike other CDKs, CDK9 does not regulate cell-cycle progression, but the expression of a subset of genes, including BRCA1 which facilitates homologous recombination (HR) repair following DNA-damage-response. Disabling CDK9 reduces the levels of BRCA1 and HR in ovarian cancer (OC) cell lines and sensitizes cells to PARP inhibitors (PARPi), which are selectively toxic to cells with compromised HR. Use of PARPi is well established in OC and preferably in the HRD subgroup (50% epithelial OC or EOC), but also in the non-HRD or HR-proficient (HRP) subgroup where the response to this costly therapy is poor. This represents a clinical unmet need as well other HRD cancers where PARPi resistance is emerging. It has become increasingly evident that most cancers contain subpopulations of drug-tolerant persister cells (DTPC) (variously referred as cancer-stem-cells or CSCs) with enhanced tumorigenicity and chemoresistance. A current study (PROVAT-2) in Kolkata including our ongoing work is evaluating the role of CSC in HR-stratified subgroups in OC and its role in acquired chemoresistance following neo-adjuvant chemotherapy (NACT). However, it is still unclear how DTPCs survive DNA-damaging agent treatment and tumors regenerated by surviving cells develop chemoresistance; there is a complex interplay between other tumor-microenvironmental factors including secretion of extracellular-vesicles, monocyte-macrophage-axis (MMA), tumor-associated-macrophages (TAMs), cancer-associated-fibroblasts (CAFs), inflammation dominated by VEGF/COX-2/PGE2. Our study objective is to decipher whether CDK9

mutations/reduced CDK9 levels affect the responses of human OC to PARPi in DTPC. We discovered a novel orally active CDK-9 inhibitor (CDK9i) (IIIM-290 from *Dysoxylum binectariferum,* SK Guru et al., 2018 US Patent 9,932,327, 2018; JMC. 2018; 61: (4) 1664–1687) which is less toxic with high specificity in most cancers with very good T1/2 and is already approved for pancreatic cancer clinical trial by DCGI/DST by Govt. of India (2020). We propose to extend its use in other cancers by designing preclinical proof of concept studies leading to early phase clinical trials.

Project-4: Evaluation of anti-tumor activities of some indigenous medicinal plant derived phytochemicals

I. Anticancer effect of *Holarrhena antidysenterica* derived triterpene compounds

This study is aimed to decipher the anticancer efficacy of some natural triterpene compounds from *Holarrhena antidysenterica.* For this purpose, isolation of chemical constituents by column chromatography technique from seed pods of *Holarrhena antidysenterica (family: Apocynaceae)* have been done. Compounds were purified, characterized and structures assigned by 1D and 2D NMR experiments. Three compounds have been isolated - One novel compound, Holarol, along with two known compounds, 5dihydrocanaric acid and betulin.

The studies on differential sensitivity of the drugs on different cancer cell lines- HeLa, Raji, EAC and T24 exhibited that dihydrocanaric acid has higher cytotoxicity in T24 bladder cancer cell line. Holarol and betulin also have shown greater sensitivity towards T24 cell line than the other tumor cells except for EAC in case of holarol. So, our further study was carried on the T24 cell line due to its high sensitivity to the compounds. It has been seen that holarol could generate high ROS level in T24 cell line followed by betulin and dihydrocanaric acid. Dual acridine orange/ethidium bromide fluorescent staining was used to examine morphological apoptosis in the T24 cell line with the compounds. Frequency of apoptotic cells high after holarol treatment followed by betulin and dihydrocanaric acid.

The isolated triterpenes have been modified to increase their solubility and efficacy. The efficacy and solubility were enhanced in epoxide derivatives compared to the other derivatives. The epoxide derivative of dihydrocanaric acid showed significant cytotoxic effect on the T24 cell line. In FACS analysis, dose dependent increase in G2/M population of T24 cell was seen after treatment with the epoxide derivative of dihydrocanaric acid. Thus, the triterpenoid compounds isolated from *Holarrhena antidysenterica* have significant antiproliferative activity on the T24 bladder cancer cell line. This may be due to apoptosis induced by ROS generation associated with G2/M arrest.

II. Downregulation of Hyaluronic acid-CD44 signaling pathway in cervical cancer cell by natural polyphenols-Plumbagin, Pongapin and Karanjin

Hyaluronic acid (HA)-CD44 pathway showed association with several malignancies. The natural polyphenols Plumbagin, Pongapin and Karanjin showed anti-cancer activities in different tumors including cervical carcinoma. To understand their mechanism of anti-cancer activity, the effect of the compounds on HA-CD44 pathway was analyzed in cervical cancer cell line HeLa. The mRNA expression of three different isoforms of CD44 i.e., CD44s, CD44v3 and CD44v6, was differentially down regulated by the compounds. This was validated by western blot and immuno-cytochemical analysis of CD44s.The low molecular weight HA

(LMW-HA) showed growth promoting activity in HeLa at low concentration, whereas high molecular weight HA (HMW-HA) had no such effect. The compounds could preferentially down regulate the LMW-HA level in HeLa, as evident in the cell as well as in the cell free conditioned medium. Concentration dependent upregulation of HA synthase-2 (HAS2) was seen in the cell by the compounds, whereas differential down regulation of hyaluronidases 1-4 (HYAL 1-4), predominantly HYAL1, were seen. The compounds could also down regulate the downstream target of the pathway p-AKT (T-308) in concentration dependent manner. Thus, the compounds could attenuate the HA-CD44 pathway in HeLa cell to restrict the tumor growth.

Extramural projects ongoing:

1. Use of phosphoprotein biomarkers to develop plasmonic ELISA for predicting chronic hepatitis, liver cirrhosis and hepatocellular carcinoma. Indian Council of Medical Research, August 2019 to July 2022. *(PI: Dr. C. K. Panda).*

2. Analysis of molecular pathogenesis of uterine cervical carcinoma for the development of targeted therapy. NASI Senior Scientist Platinum Jubilee Fellowship of Dr. C. K. Panda. March, 2020 to February, 2023.

3. Identification of non-invasive microRNA and proteomic biomarkers in plasma for early detection of Head and Neck Squamous Cell Carcinoma in Indian patients. Indian Council of Medical Research, September 2019 to August 2022. *(PI: Dr. S. Dutta).*

4. Evaluation of population prevalence and oncogenic potential of novel HPV type 217, 218, 223, and 225. IARC Return Grant to Dr. S. Dutta; IARC-WHO, France. June, 2019 to May, 2021*(PI: Dr. S. Dutta)*.

Students' Projects ongoing:

1. Analysis of alterations of Wnt and hedgehog pathways during development of head and neck squamous cell carcinoma (HNSCC). UGC-NET Research Fellowship of Mr. Balarko Chakrobarty, since October 2015 to September 2020. *(PI: Dr. C. K. Panda).*
2. Analysis of DNA modifying and DDR (DNA damage response) genes associated with the development of uterine cervical carcinoma (CACX). DST-INSPIRE Junior Research Fellowship of Ms. Priyanka Dutta since June 2017 to June, 2022. *(PI: Dr. C. K. Panda).*
3. Anti-cancer effects of Holarrhena antidysenterica derived triterpene compounds. DST- Women scientist scheme (A) of Dr. Anindita Ghosh, since January 2018 to January 2021.
4. Evaluation of LIMD1-VHL targeting micro-RNA(s) as biomarker in Uterine Cervical Carcinogenesis. CSIR-NET Research Fellowship of Ms. Farhin Sultana, since June 2019 to May, 2024. *(PI: Dr. S. Dutta)*
5. Crosstalk between Autophagy and extracellular vesicles in drug tolerant persister cells and its contribution to cancer initiation. CSIR-UGC-NET Research Fellowship of Ms. Essha Chatterjee since August 2019 to July 2024. *(PI: Dr. S. K Guru)*

6. Role of metabolic waste (ammonia) and EMT in drug tolerant persister cells by PI3K/Akt/mTOR signalling. CSIR-UGC-NET Research Fellowship of Mr. Biswajit Dey since March 2020 to February 2025. *(PI: Dr. S. K Guru)*

Publications:

1. Basu M., Ghosh S., Roychowdhury A., Samadder S., Das P., Addya S., Roy A., Pal D. K., Roychoudhury S., Ghosh A., Panda C. K.: Integrative genomics and pathway analysis identified prevalent FA-BRCA pathway alterations in arsenic-associated urinary bladder carcinoma Chronic arsenic accumulation in cancer tissues hampers the FA-BRCA pathway. Genomics: 112, (6), 5055-5065, 2020. https://doi.org/10.1016/j.ygeno.2020.09.012
2. Barua, A., Choudhury, P., Mandal, S., Panda, C. K. and Saha, P.: Anti-Metastatic Potential of a Novel Xanthone Sourced by Swertia chirata Against In Vivo and In Vitro Breast Adenocarcinoma Frameworks. Asian Pac J Cancer Prev: 21, 2865–2875, 2020.
3. Barua, A., Choudhury, P., Mandal, S., Panda, C. K. and Saha, P.: Therapeutic potential of xanthones from Swertia chirata in breast cancer cells. Indian J Med Res: 152, 285–295, 2020.
4. Chakraborty, B., Mukhopadhyay, D., Roychowdhury, A., Basu, M., Alam, N., Chatterjee, K., Chakraborty, J. and Panda, C. K.: Differential Wnt-β- catenin pathway activation in HPV positive and negative oral epithelium is transmitted during head and neck tumorigenesis: clinical implications. Medical Microbiology and Immunology, DOI. 10.1007/s00430-020-00697-9.
5. Bankura, B., Maji, S., Chakraborty, B., Alam, N. and Panda, C. K.: Activation of EGFR/IGF1R - β-catenin - CD44 pathway in periampullary cancer. Journal of Radiation and Cancer Research, 11:150-156, 2020; DOI: 10.4103/jrcr.jrcr_54_20
6. Basu, M., Chakraborty, B., Ghosh, S., Samadder, S., Dutta S., Roy, A., Pal, D. K., Ghosh, A. and Panda, C. K.: Divergent molecular profile of PIK3CA gene in arsenic associated bladder carcinoma. Mutagenesis, DOI: 10.1093/mutage/geaa031.
7. Ghosh, S, Basu, M., Pal Chowdhury, S., Pal, T., Pal, D. K., Panda, C. K., Ghosh, A.: Arsenic level in bladder tumor of patients from an exposed population; association with progression and prognosis. Future Oncology, DOI: 10.2217/fon-2020-0154 (2021).
8. Agrawal A., Datta C., Panda C. K. and Pal D. K.: Association of beta-catenin and CD44 in the development of renal cell carcinoma. Urologia Journal 88(2), 125–129, 2021. DOI: 10.1177/0391560320980672
9. Das D., Maitra A., Panda C. K., Ghose S., Roy B., Sarin R., Majumder P. P.: Monotonic dysregulation of genes and pathways during progression from normal through leukoplakia to gingivo-buccal oral cancer identified. Genomic Medicine (2021) 6:32; https://doi.org/10.1038/s41525-021-00195-8.
10. Immunotherapy of Cancer: Advances in Cancer Research (Vol. 143); Edited by Xiang-Yang Wang and Paul B. Fisher, reviewed by Dr. C. K. Panda for Indian Journal of Medical Research, 2020.

Other Academic Activities:

I. Conference Participation:

A) Invited talks:

1. Dr. Chinmay Kumar Panda has delivered a lecture on "Emergence of precision medicine in treatment of cancer" in ONE DAY NATIONAL CONFERENCE ON "CANCER AWARENESS" ON THE OCCASION OF WORLD CANCER DAY (FEBRUARY 4, 2021) Organized by Sido Kanhu Murmu University, Dumka, Jharkhand. MODE: E-CONFERENCE.

2. Dr. Sankhadeep Dutta has delivered a lecture on "Cervical Cancer Control: A Translational Research Approach" during 3rd Annual meet of Kolkata Gynecological Oncology Trials

and Translational Research Group (KolGoTrg) held on February 07, 2021 at Hotel Hindustan International, Kolkata.

B) Oral presentation:

1. R. Roy, A Barua, D Pal, S Sur, J Chakraborti, S Dutta, S Mandal, P Saha, Chinmay K. Panda. Effect of the three plant-derived polyphenolic compounds-Pongpin, Karanjin and Plumbagin on in-vivo mouse transplantable tumor cell line-Ehrlich ascites carcinoma. 90th Annual Session of the National Academy of Sciences, India and Symposium on 'Towards a New Healthcare regime for the Nation', on February 25-27, 2021. MODE: E-CONFERENCE.

2. Farhin Sultana, Dipanwita Banerjee, Puja Chatterjee, Manisha Vernekar Roy, Rakiba Begam, Ranajit K. Mandal, Jayanta Chakrabarti, Chinmay K. Panda, Sankhadeep Dutta. Deregulation in expression of LIMD1 protein in the transforming epithelium during cervical carcinogenesis. 90th Annual Session of the National Academy of Sciences, India and Symposium on 'Towards a New Healthcare regime for the Nation', on February 25-27, 2021. MODE: E-CONFERENCE.

II. Miscellaneous:

1. Mr. Anirban Roy Chowdhury has received Ph.D degree for his thesis entitled "Molecular analysis of regulation of Cyclin-dependent kinase inhibitor 1C (CDKN1C) and Receptor Tyrosine Kinases (IGF1R and EGFR) in Uterine Cervical carcinoma of Indian patients" from Calcutta University in the year 2020.

2. Mrs. Rituparna Roy has received Ph.D degree for her thesis entitled "Evaluation of anti-tumor activities of some natural polyphenolic compounds" from Jadavpur University in the year 2021.

3. Dr. Chinmay Kumar Panda chaired a scientific session of "SECOND INTERNATIONAL SCHOOL ON RADIATION RESEARCH (ISRR-2020)". Theme: Radiation Induced DNA Damage Response: Mechanisms and Human Health Implications, September 6-20, 2020. MODE: E-CONFERENCE

4. Dr. Chinmay Kumar Panda is acting as member of the editorial board in the "International Journal of Human Genetics".

5. Dr. Chinmay Kumar Panda is acting as Academic Editor in the journal "Scientific Reports".

6. Dr. Chinmay Kumar Panda reviewed 53 scientific papers of different peer-reviewed journals like AAPS Pharma SciTech, Bioscience Report, Int. J. Oncology, J. Biosciences, Scientific Report, Indian Journal of Medical Research, Oncology Letters, Molecular Medicine Reports, Expert Review of Molecular Diagnostics, Plos One, J. Int. Med. Res., Theranostics, American J. Med. Sciences, Eur. J. Gynaecological Oncology, Genetic Testing and Mol. Biomarkers, Food and Chemical Toxicology, Oral diseases, Future Oncology, J. of Functional Foods, Studies in Natural Products Chemistry, J. of Genetic and Mutation Disorders, Technology in Cancer Research & Treatment, 3Biotech, Cancer Control, Cellular & Molecular Biology Letters, Exp. Cell Research, J. of Gynaecological Research, The American J. of Medical Sciences, Oncology Reports, Everyman's Science, BMC Research Notes, BBA-MCR, Breast Cancer Basic and Clinical Research, Cancer Letters, J. of Hematology & Oncology, Mol. Cell Oncology, Toxicology Research, Eur. J. of Cancer, Medical Science Monitor, Expert Rev. On Gastroenterology and Hepatology,

BMC Cancer, French-Ukrainian J. Chemistry, Molecular and Clinical Oncology, Experimental and Therapeutic Medicine, Frontiers in Public Health, J. Med. Virology, Canadian J. of Physiology & Pharmacology, Int. J. Mol. Med., Epigenomics, FEBS Open Bio, Biochemistry and Biophysics Reports, Infectious Agents and Cancer, Clinical Medicine Insights: oncology.

7. Dr. Chinmay Kumar Panda acted as External examiner of Ph.D thesis under i) Indian Institute of Technology, Madras, ii) Guru Nanak Dev University, Amritsar, iii) Ranchi University, iv) Calcutta University, v) Jadavpur University.

Department of Pathology and Cancer Screening

Head of the Department: Dr Partha Nath

Team Members

Name	Designation
Faculty	
Dr. Partha Nath	HOD
Dr. Vilas D. Nasare	SSO II
Dr Sutapa Mahata	DHR Woman Scientist
Miss Sinjini Sarkar	DHR Young Scientist
Miss Ranita Pal	DST Woman Scientist
Miss Dipanwita Ghosh	Senior Research Fellow
Mr. Pranab Kumar Sahoo	Senior Research Fellow
Tanuma Mistry	Junior Research Fellow
Sushmita Ghosh	Junior Research Fellow
Other Team Members	
Miss Debpriya Banerjee	Field Worker
Miss Piu Das	Field Worker
Mrs. Sangita Bhaduri	Female attendant
Mr. Shukla	GDA
Mrs. Shyamali Dhara	GDA

Objective

The department of Pathology and Cancer Screening is catering to comprehensive cancer screening and awareness program for last 38 years. The program covers both rural and urban areas of west Bengal and adjoining states. In addition this department is also engaged in basic cancer research program for last 27 years and has published many fundamental research papers in national and international journals.

Work done

Project running (Extramural)

1. **Study on MAD and BUB1 genes of Spindle Assembly Checkpoint with response to primary adjuvant chemotherapy in advanced ovarian cancer patients.**
   Principal Investigator: Sinjini Sarkar (Young Scientist)
   Mentor: Dr Vilas D. Nasare
   Funding Agency: Department of Health Research
2. **MicroRNAs as prognostic biomarkers of chemoresistance and chemosensitivity in ovarian cancer patients undergoing combinational therapy**
   Principal Investigator: Ranita Pal (Women Scientist A)
   Mentor: Dr Vilas D. Nasare
   Funding Agency: Department of Science and Technology
3. **A pharmacogenetics study on cytochrome P450 enzyme and transporter gene implicated in response to paclitaxel, cisplatin, and 5-fluorouracil in oral cancer patients**
   Principal Investigator: Dr Vilas D. Nasare
   Funding Agency: Indian Council of Medical Research

4. **Investigation of PIM1/STAT3 association as a regulator of EMT in triple negative breast cancer**
   Principal Investigator:
   Dr Sutapa Mahata (DHR Women Scientist)
   Mentor: Dr Vilas D Nasare
   Funding Agency**:** Department of Health Research
5. **Study on CYP2D6 and ABCB polymorphisms with respect to tamoxifen adjuvant treatment in ER and PR receptor breast cancer patients**
   Principal Investigator: Dr Vilas D. Nasare
   Funding Agency: Council of Scientific and Industrial Research
6. **Intermittent PARP inhibitor in recurrent ovarian cancer (IPIROC)**
   As A co-Investigator
   Funding Agency: DBT-CRUK

Project running (Internal)

1. **Assessment of the knowledge and attitude about cervical cancer, HPV infection, HPV vaccine, its acceptability among cervical cancer patients and associate visitors at regional cancer centre, Chittaranjan National Cancer Institute, Kolkata**
   Principal Investigator: Dr Vilas D Nasare
2. **Assessment of the perception about breast cancer symptoms, risk factors, treatment and prevention among breast cancer patients and associated visiting members**
   Principal Investigator: Dr Vilas D Nasare
3. **Awareness, perception, risk factors, treatment regarding oral cancer among oral cancer patients and their attendants in Eastern population: a hospital based cross sectional study**
   Principal Investigator: Dr Vilas D Nasare
4. **Identification of the causal involvement of HPV through assessment of oncogenic and proliferative markers, apoptosis and content assay in cervical Pre-neoplastic lesions for risk categorization**
   Principal Investigator: Dr Vilas D. Nasare
5. **A study on sorcin mediated pathway of Multidrug resistance in Gastric Carcinoma**
   Principal Investigator: Dr Vilas D. Nasare

DNB Students

1. **Clinicopathological study of gastric carcinoma with special reference to erk-1/erk-2 and bcl2: an observational study in a tertiary care cancer hospital**
   Student Name: Dr Raya Banerjee
2. **Studies on clinico-pathological profile of head and neck squamous cell carcinoma with special reference to ki67**
   Student Name: Dr. Shubhadeep Panda

Book Publications

Book: Dr.Vilas D Nasare (Editor and Author)
Cervical and Ovarian Cancers: A complete Approach on Molecular Basics and Therapeutics,

Book Synopsis considered on Dated March 31, 2021, Cambridge University Press, Cambridge **CB2 8BS UK.**

Publications (as Corresponding author) (2020-2021)

Published Papers

1. Sahoo PK, Sarkar S, Ghosh D, Mahata S, Pal R, Mistry T, Ghosh S, Roy A, Bucha H, Mandal S, **Nasare VD**. Premalignant and malignant lesions of oral cavity in eastern India: a hospital-based study. **Eur J Cancer Prev. 2020 Nov 27.**
2. Kumar S,' Lathwa E, Kumar G, Saroha B, Kumar S, Mahata S, Sahoo PK, **Nasare VD .**Synthesis of pyrazole based novel aurone analogs and their cytotoxic activity against MCF-7 Cell line. **Chemical Data collections (2020). Volume 30,2020,**
3. Sarkar S, Sahoo PK, Mahata S, Pal R, Ghosh D, Mistry T, Ghosh S, Bera T, **Nasare VD.** Mitotic checkpoint defects: en route to cancer and drug resistance. **Chromosome Res. 2021 Jan 6**. doi: 10.1007/s10577-020-09646-x.

Other Academic Activities

Workshop Attended

1. Era of long reads & SMRT technology, Virtual Technical Seminar November 27, 2020
2. Webinar Attended, GCIC gynaecologic cancer Intergroup, Functional HRD assay and the PROVAT (Project Ovarian Translational) 5 June 2020
3. Webinar Attended GCIG Virtual Autumn Meeting By Virtual Mode (Zoom Video Conferencing App) October 27 - November 14, 2020
4. Virutual Meeting**,** World ovarian Cancer Coalition meeting HIPEC in Homologous Recombination stratified ovarian cancer, October 2020

Conferences attended

1. International conference on Recent Trends in Pharmaceutical, Medical and Applied Sciences for Global Development By Virtual Mode (Zoom Video Conferencing App) January 28-29, 2021
2. Platinum response and Micro RNA, Ranita Pal, Manisha Vernekar, Asima Mukhopadhyay, Vilas Nasare 3rd Annual Meeting Oganised by Kolkata Gynecological Oncology Trials and Translational Research Group. Hotel Hindustan International,Kolkata date:07.07.2020

Poster Presentation

1. Sinjini Sarkar, Ranita Pal, Sutapa Mahata, Pranab K Sahoo , Sushmita Ghosh , Puja Chatterjee, Manisha Vernekar, Partha Nath, Kalyan K Mukherjee, Tanmoy Bera , Vilas D Nasare. Pain experienced to ovarian carcinoma patients at diagnosis and while receiving first-line treatment therapy By Virtual Mode (Zoom Video Conferencing App) January 28-29, 2021

Student Undergoing PhD

Four students are undergoing, their PhD curriculum in the department.

Students Undergoing DNB

Three students are undergoing, their DNB curriculum in the department.

Department of RECEPTOR BIOLOGY & TUMOR METASTASIS

Team

Name	Designation
Dona Sinha, Ph.D	**Senior Scientific Officer, (SSO-I Grade) and Head of the Department**
Nabanita Chatterjee, Ph.D	Senior Scientific Officer-II
Suchisnigdha Datta	ICMR-SRF
Priyanka Saha	CNCI-JRF
Sraddhya Roy	UGC-JRF
Ananya Das	CSIR-JRF
Sukanya Ghosh	WBPCB -JRF
Paramita Ghosh	WBPCB -Project Assistant
Anurima Samanta	DSTBT, JRF
Srikanta Barua	Lab Attendant

Objectives of the Department:

- Health impact of chronic arsenic exposure on rural population of West Bengal and assessment of risk of arsenic-induced carcinogenesis in asymptomatic individuals
- Health effects of air pollution especially particulate matter2.5 in asymptomatic population of Kolkata
- Redox regulation of cancer cells by phytochemicals
- EMT, cancer stemness and drug resistance in oral cancer
- Prognostic significance of biomarkers with respect to drug resistance in lung adenocarcinoma
- Metabolic and immunological changes of different biomolecules involved in cancer progression, metastasis and drug resistance.
- Dysregulations in various metabolic pathways and identifying different biomolecules in order to target them as a mode of anti-cancer therapy.

Brief description of the work done during the year:

A. Extramural Projects

PI	Project Title	Funding Agency	Status
Dr Dona Sinha	Impact of air quality on human health: Exploration of probable PM2.5 triggered pathways associated with lung cancer in exposed population of Kolkata	West Bengal Pollution Control Board	Ongoing
Dr Dona Sinha	Crosstalk of delta Np63 alpha with cancer stemness and epithelial mesenchymal transition: a study during two different neo adjuvant chemotherapeutic regimens in oral cancer	Dept. of Science and Technology and Biotechnology, Govt. of West Bengal	Ongoing
Dr Dona Sinha	Redox regulation of nuclear factor erythroid-245 (NF-E2) related factor Nrf2 in lung cancer by green and black tea polyphenols: Implication in cancer therapeutics	Indian Council of Medical Research	Ph.D work completed

Dr Dona Sinha	Exploration of EGCG chitosan nano particles (NP) against cancer stem cells in arsenic-induced lung cancer	International Fellowship by Indian Council of Medical Research-Department of Health Research	Kept on hold due to COVID-19 pandemic

B. Students' Projects

PI	Student	Project Title	Funding Agency
Dr. Dona Sinha	Priyanka Saha	Effects of anesthetic agents on immune-inflammatory response of breast cancer (pilot project for 1yr)	CNCI, Ministry of health and Family Welfare, GOI
Dr. Dona Sinha	Suchisnigdha Datta	A study on the prognostic significance of Nrf2 mediated chemoresistance in lung adeno carcinoma	Indian Council of Medical Research-SRF
Dr. Nabanita Chatterjee	Sraddhya Roy	Exploring the roles of exosomes in the metabolic regulations of metastatic ovarian cancer	UCG, India
Dr. Nabanita Chatterjee	Ananya Das	Effect of Tumor Associated Macrophage Polarization on immune profile modulation in Tumor microenvironment of Breast Cancer subtypes	CSIR, India

C. Intramural Project

PI	Project Title	Funding Agency	Status
Dr Dona Sinha Jt-PI: Dr Deepa Chakrabarti	Effects of anesthetic agents on immune-inflammatory response of breast cancer (pilot project for 1yr)	CNCI, Ministry of health and Family Welfare, GOI	Project towards completion

D. Interesting Observations

A pilot study has been undertaken to investigate the effect of propofol/isoflurane during the peri operative period on the immune cell response of the breast cancer. In this study, we aimed to compare the impact of intravenous anesthetic propofol and inhalation anesthetic isoflurane on B lymphocytes, T lymphocytes [helper T (Th) cells and cytotoxic (Tc) cells] and on natural killer (NK) cells and their cytotoxic activity. In the light of the results obtained in the pilot study, the trend indicates that use of intravenous anesthetic propofol may provide a better advantage over inhalation anesthetic isoflurane against immune suppression during perioperative period of breast cancer surgery. In a nutshell in comparison to isoflurane, propofol did not suppress B cells, increased Th cells, maintained a constant level of Tc cells, induced NK cells and did not hamper NK cell activity. Though the results were not statistically significant, a study on a larger sample

size might help us to validate the beneficial effect of propofol over isoflurane against immune suppression during breast cancer surgery.

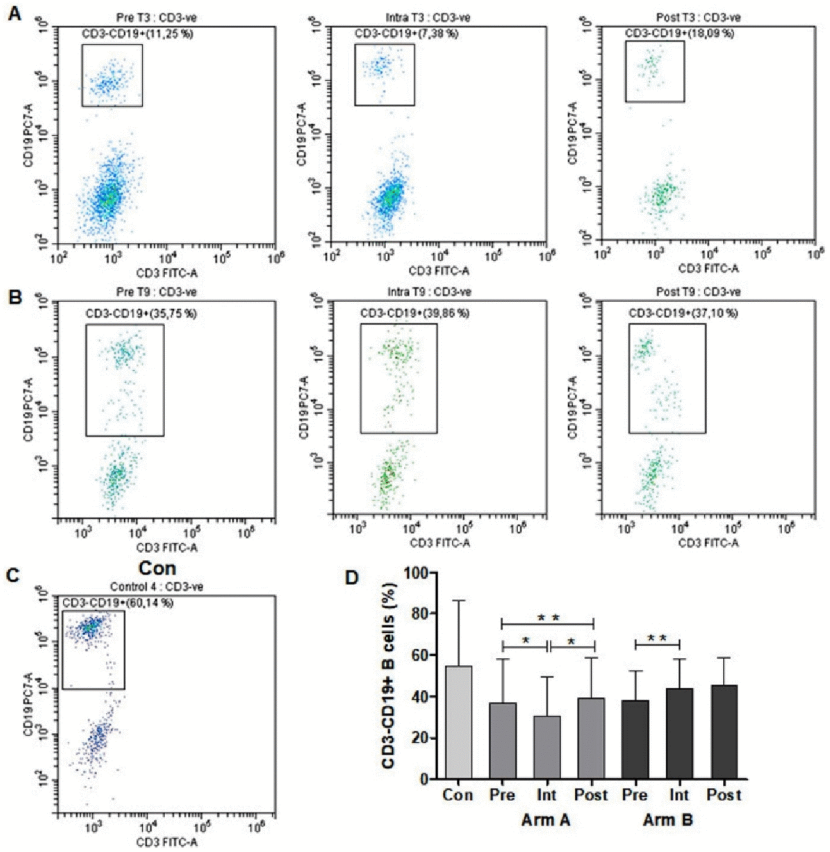


Fig.1:Flowcytometric analysis of CD3-CD19+ B lymphocyte populations in peripheral blood of breast cancer patients as pre (1day before surgery), intra (1 h after incision) and post (48 h after surgery) and con (control).A. CD19+CD3- B cell populations (%) in representative patient anesthetized in arm A; **B.** CD19+CD3- B cell populations (%) in representative patient anesthetized in arm B and **C.** Control, representative female without breast cancer; **D.** Comparative analysis of B cells between control and breast cancer patients during perioperative period undergoing anesthesia in arm A/ B. The graphs were plotted based on the mean and SD value of the plot CD3-CD19+ cell population. Statistical significance at *p<0.05 and **p<0.01. Arm A: Isoflurane; Arm B: Propofol; Con: control; Pre: preoperative (sample taken 1 day before surgery); Int: intraoperative (sample taken 1h after incision); Post: postoperative (sample taken 48h after surgery)

Pulmonary cancer confronts the greatest hurdle of resistance against most chemotherapeutic drugs. This may be circumvented with combination of conventional chemotherapy with bioactive herbal adjuvant. Epigallocatechin-3-gallate (EGCG), was investigated for its chemo-sensitizing property along with Doxorubicin (Dox), in an intrinsically non-responsive lung adenocarcinoma (LAC) cell line, A549. A compromised functionality of Dox was reversed when EGCG was used as an adjuvant. On one hand Dox(10μM)-EGCG(0.5μM) post-treatment combination decreased the drug efflux, multi-drug-resistance (MDR) signaling, invasiveness while on the other hand it increased drug internalization, cell-cycle arrest, stress-induced damage, and finally cell-death (Fig.2). The resistant nature of A549 was probably due to

constitutive activation of nuclear erythroid 2-related factor 2 (Nrf2) and its upstream/downstream antioxidant effectors, which were also pro-oxidatively coordinated by EGCG. In conclusion low dose EGCG improved Dox-toxicity and imparted oxidative damage-mediated antineoplastic efficacy by reorienting the redox signaling in A549 LAC cells.

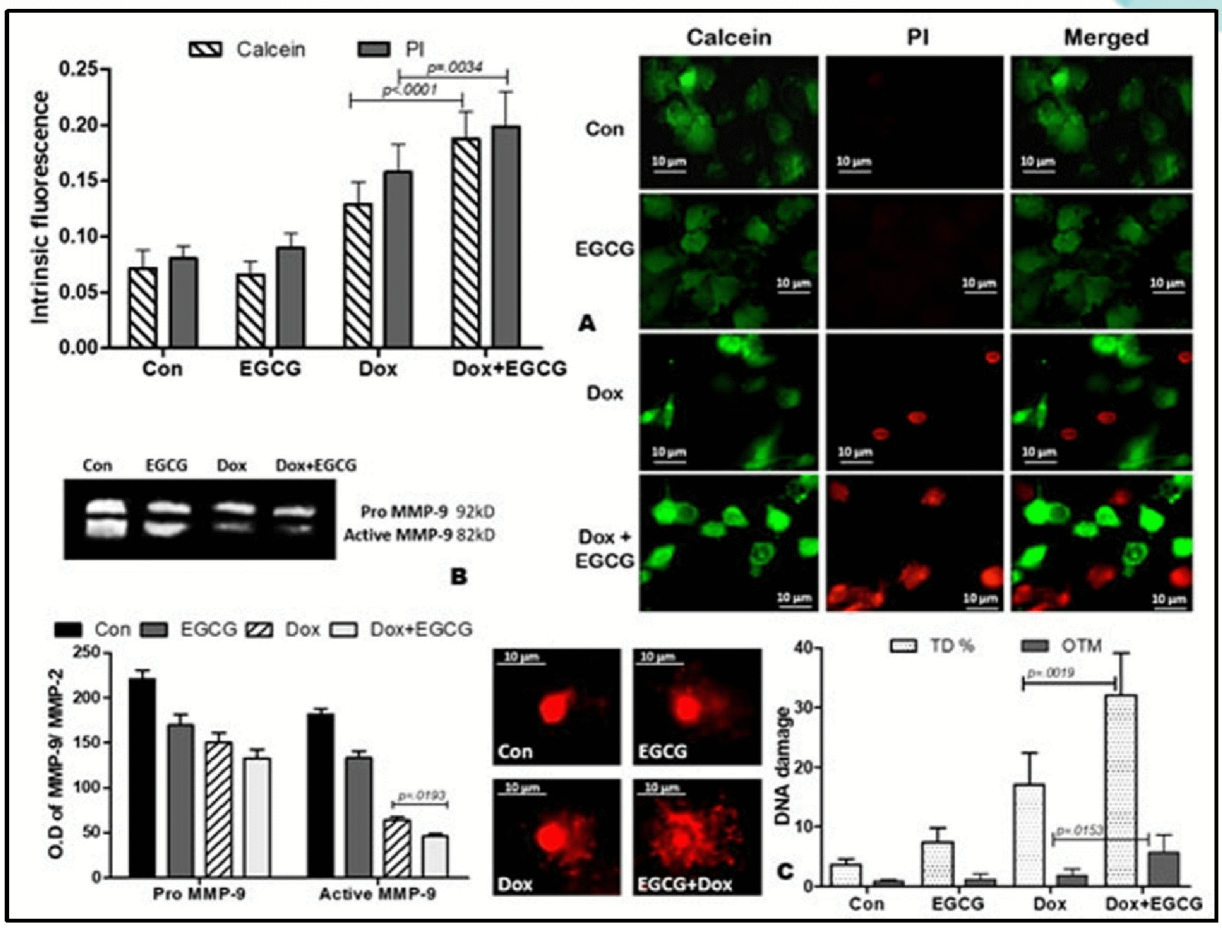


Fig.2: Effect of EGCG on overcoming MDR against Doxorubicin (Dox) in A549 cells. Effect of EGCG (0.5µM/12h)/Dox (10.05µM/48h)/Dox+EGCG on MDR as represented by Calcein-AM/PI staining (A); on gelatinolytic activity of pro and active MMP-9 (B); on the extent of DNA damage [TD% and OTM] as measured by comet assay (C). Data represented as mean±SD.

Air pollution is an environmental hazard which poses an impending threat to human health. With the increase of anthropogenic activities, industrialization and vehicular burden the threat of air pollution is impregnating deeper within the societal health. Among the air pollutants, particulate matter (PM) having a diameter of ≤2.5µm (PM2.5) are the main contributors of health-related issues including respiratory and cardio vascular ailments which in turn lead to morbidity and premature mortality. The multi ranging effects of PM2.5 include inflammation, oxidative stress, DNA damage, immune response, genetic and epigenetic changes in the lungs. Owing to their small size, they remain longer in the atmosphere, increasing the risk of inhalation at a much higher rate. Though majority of the PM [(particles having a diameter of ≤10µm) PM10] are trapped and cleared by mucocilliary nasal process but PM2.5 are capable of entering deep within the lung alveoli. PM2.5 further evade the lung's respiratory barrier and enter into body's systemic circulation. It has been already concluded by the IARC that PM2.5 increases the risk of lung cancer. The prescribed annual average of PM2.5 standard according to the National Ambient Air Quality Standards

(NAAQS), India is 40ug/m^3 and that of 24h average is 60 ug/m^3. India has the world's second largest population and half of the population resides in the areas where the annual PM2.5 level is above 40ug/m^3. With this background we have started to investigate the characteristic features of apparently normal (asymptomatic individuals) in an area with higher levels of PM2.5 (>60µg/m^3) having a real time air quality monitoring station by a questionnaire survey (Fig.3).

Fig.3: Questionnaire survey at different sites of Jadavpur, Kolkata

The work has been initiated among roadside shopkeeper who spend at least 8-10h at their shops in Jadavpur, Kolkata and the air quality assessment were done on the basis of the data available at the West Bengal Pollution Control Board website. A clear seasonal variation was observed with monthly means of PM2.5 concentration. Throughout the last six years 2015-2020, the level of PM2.5 was observed to increase from October which reached the peak during December-January. February onwards it showed a decreasing trend till April and from May to September it maintained a low-level plateau (Fig.4)

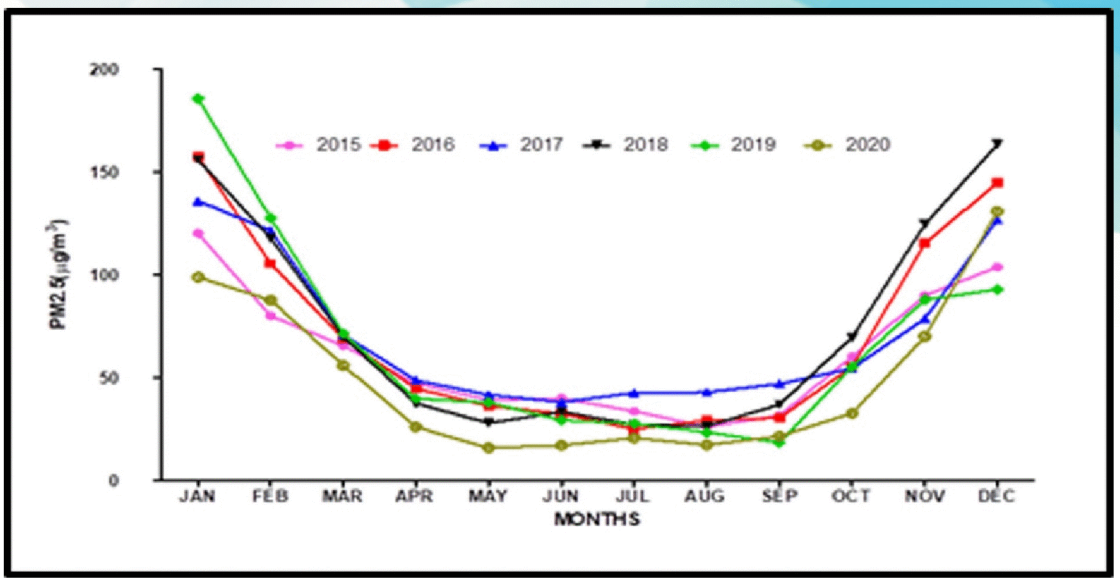


Fig. 4: Comparison of monthly mean PM2.5 during 2015-2020 in Kolkata

Since we had initiated our questionnaire survey in Jan 2021 it was interesting to decipher the comparative analysis of PM2.5 concentration during Jan-Mar in 2020 and 2021. The increased trend of PM2.5 concentrations were maintained during Jan and Feb 2021.The comparative analysis depicted that PM2.5 levels were 1.9 times higher during Jan 2021 than Jan 2020 *($p < 0.0001$)* and 1.4 times elevated during Feb 2021 than Feb 2020 *($p=0.0040$)* (Fig.5). However, the difference between 2020 and 2021 monthly mean PM2.5 started decreasing when winter gave way to spring which was evident from the comparisons of Feb and March. This was probably because PM2.5 concentration is highest in winter and starts decreasing in spring.

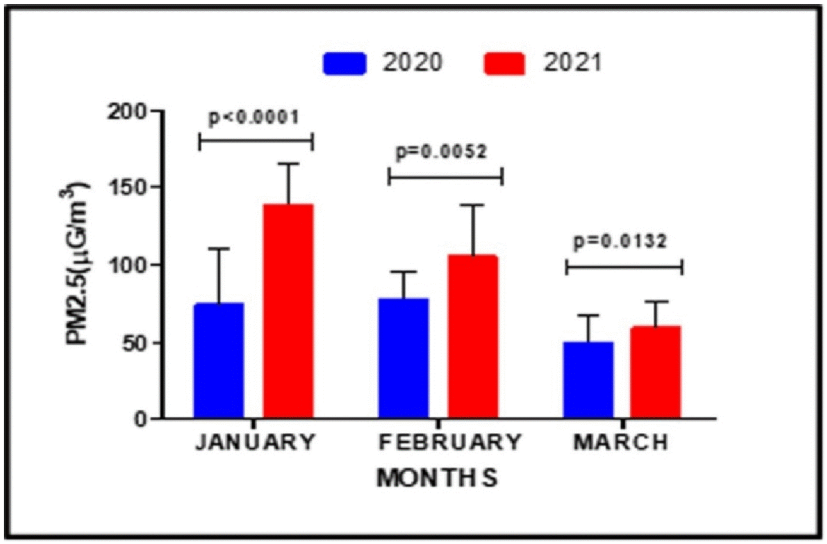


Fig.5: Comparison of monthly mean PM2.5 (µg/m^3) during 2020 and 2021 in Jadavpur

The roadside shopkeepers screened with questionnaire at different sites of Jadavpur have been represented in the following flow chart (Fig.6)

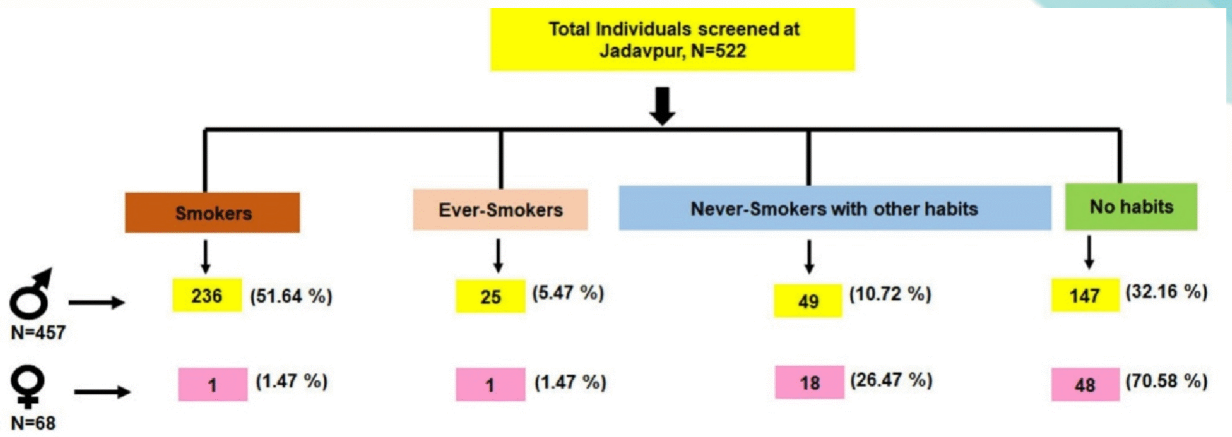


Fig.6: Flow chart representing different categories of individuals (roadside shopkeepers) screened with their respective percentages

Individuals with upper or lower respiratory tract symptoms (URS/LRS) have been depicted in Fig.7. The higher percentage of males having respiratory trouble can be easily correlated with smoking habits or smoking history. However, a small percentage of males (19.17%) having no smoking as well as other habits too had respiratory trouble which may have been due to air pollution. In contrast to males, a large percentage of females with no habits at all reported respiratory troubles (23.07%), which gave definite indications that smoking was not the sole cause of these ailments. The greater the distance of the shop from the main road the lesser was the frequency of LRS among these roadside shop keepers (Pearson's correlation; -0.145, N:188, p value:0.046). The use of mask was also negatively correlated with occurrence of LRS among these shopkeepers. There were considerable number of individuals who were not exposed to either active or passive smoking but had these troubles. This can provide us a warning that there may be other factors such as air pollution which are involved in causing such respiratory troubles.

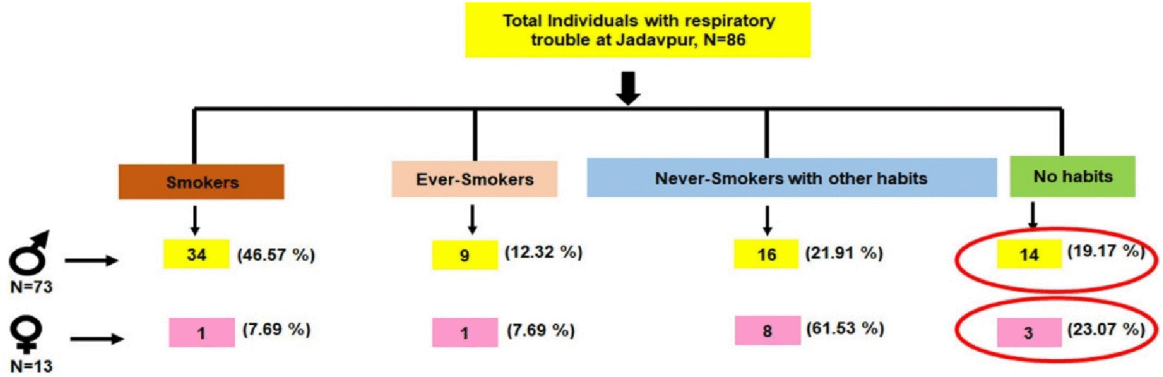


Fig.7: Categorization of screened individuals (roadside shopkeepers) with respiratory troubles at Jadavpur, Kolkata. This flow chart showed an alarming rise of respiratory ailments among individuals who had no addictions.

Ovarian cancer is the deadliest gynecological malignancy with high mortality rate. Dysregulations in metabolism play a vital role in the development of ovarian cancer. Furthermore, alterations in metastatic markers also perform role in cell differentiation, proliferation, invasion and drug resistance. A preliminary study conducted on the body metabolic parameters revealed that there has been difference in occurrence and development of ovarian cancer in the epithelial type and non-epithelial type. The prevalence of epithelial cancer is more in patients with late age group 50-60 years whereas non-epithelial type occurs mainly in less than 18 years of age. Further for clinical investigations metabolic marker Sirtuin 1 (SIRT1) has been analyzed in adjacent normal and tumor tissues of the respective patients, where SIRT1 expression level was significantly more in tumor tissues as compared to the normal ones. Since extracellular vesicles play an important role in intercellular crosstalk leading to metastasis so upon clinical investigation relative expression of exosomal marker CD81 has also been observed to be more in tumor tissues as compared to the adjacent normal. These preliminary studies suggest that the alterations in metabolic and metastatic marker perform their distinct roles in ovarian cancer and can be targeted for anti-cancer therapy.

Breast cancer (BC) is the most frequently occurring malignancy among females worldwide. According to Globocon2020 around 29.7% of total cancer cases are BC with a mortality rate of 15%. BC can be divided into several groups depending on phenotypic category with the pathogenicity and survival rate of survivors that varies highly among different subtypes. A preliminary study was conducted on the diversified roles of various immune cells present in tumor microenvironment (TME) of breast cancer. The study encompassed the anti-tumorigenic and pro-tumorigenic roles of immune cells under the stimulation of specific cytokines in breast cancer. Evaluation of the expression of (programme cell death ligand 1)PDL-1 and program cell death receptor 1)PD-1 in different subtypes of BC has also been conducted thereafter. Together with PD1and PDL-1 expression, we evaluated the morphological differences in different types of BC (invasive ductal carcinoma and infiltrating ductal carcinoma). A study on the macrophages profiling in different subtypes of breast cancer and percentage of macrophages has been conducted. In this preliminary we have observed that the expression of PD1and PDL-1 varies in different types of BC specially in invasive ductal carcinoma. Takentogether along with the expression of PD-1 and PDL-1, the macrophage profiling also alters in different types of breast cancer.

E. Publications

1. Sinha D*, Saha P, Samanta A, Bishayee A. Emerging Concepts of Hybrid Epithelial-to-Mesenchymal Transition in Cancer Progression. *Biomolecules.* 2020. Nov 16;10(11):1561. doi: 10.3390/biom10111561.**[Impact Factor: 4.082]**

2. Sarkar N, Das B, Bishayee A, Sinha D*. Arsenal of Phytochemicals to Combat Against Arsenic-Induced Mitochondrial Stress and Cancer. *Antioxid Redox Signal.*2020 Dec 10;33(17):1230-1256.doi: 10.1089/ars.2019.7950.**[Impact Factor: 7.040]**

3. Prasad P, Sarkar N, Sinha D*.Effect of low- and high-level groundwater arsenic on peripheral blood and lung function of exposed rural women.*Regul Toxicol Pharmacol.*2020. Aug; 115:104684. doi: 10.1016/j.yrtph.2020.104684. **[Impact Factor: 2.652]**

4. Sinha D*, Roy S, Saha P, Chatterjee N, Bishayee A. Trends in Research on Exosomes in Cancer Progression and Anticancer Therapy. *Cancers*. 2021;Jan 17;13(2):326. 0.3390/cancers13020326. **[Impact Factor: 6.126]**

5. Chatterjee B, Saha P, Bose S, Shukla D, Chatterjee N, Kumar S, Tripathi PP, Srivastava AK. MicroRNAs: As Critical Regulators of Tumor- Associated Macrophages. *International Journal Molecular Science*.

2020;Sep 27;21(19):7117. 10.3390/ijms21197117. **[Impact Factor: 4.556]**

Corresponding author

F. Other academic activities

Sinha D delivered an invited lecture onArsenic Menace: An alarming public health concern (online deliberation) as a resource person for Environmental Science Refresher Course, University of Burdwan on 20.2.2021

Sinha D acted as an External ExaminerforM. and Ph.D Course work of University of Burdwan on 15.1.2021 Environmental Science Refresher Course, University of Calcutta on 26.3.2021

Integrative Course Work Taught to Ph. D students:

- Cell cycle regulation
- Tumor Microenvironment
- Enzyme kinetics & Cancer Research

Number of students awarded Ph.D under Sinha D: Priyanka Prasad and Nivedita Sarkar were awarded doctoral degrees from University of Calcutta and Jadavpur University respectively.

Number of UG/PG students who completed summer training projects: 1

G. Miscellaneous

Patient care service: Pulmonary function test performed for CNCI hospital patients

Sinha D as reviewer of peer reviewed journals/book chapters:

- Elsevier: Semin Cancer Biol;
- Dove Med Press: Oncotargets Ther, Int J Gen Med;
- Taylor and Francis: Cancer Invest;
- Spandidos: Exp and Ther Med, Oncol Rep

Membership:

Sinha D
Life Member and executive body member of All India Congress of Genetics and Genomics; Life Member of Indian Association of Cancer Research; Life member of Zoological Society of India; Life Member of Environmental Mutagen Society of India

Chatterjee N
International society for Advancement of Cytometry USA, American Association for Cancer Research-USA, Canadian Society for Molecular Biosciences-Canada, American Society of Hematology-USA, Indian Immunology Society- India

Administrative responsibilities of Sinha D

- Chairperson of Central Instrumentation Research Facility
- Member of CNCI Office Council
- Member of Purchase Committee Research
- Member of Biosafety Committee
- Initiated the process of Biomedical Waste Disposal for CNCI Research

- Coordinated the Fine chemical purchase of CNCI Research

Department: SIGNAL TRANSDUCTION AND BIOGENIC AMINES

Head / In-Charge of the department: DR. NABENDU MRMU,
Senior Scientific Officer Gr-I, Ph.D

Team

	Name & Designation
Faculties	Dr. Nabendu Murmu, SSO Gr I Dr. Avik Biswas, SSO Gr II
Other Team Members	Samir Banerjee Prem Chand Das
Students	Sayantan Bhattacharyya, SRF, DST INSPIRE Sudipta Ray, SRF, UGC Paramita Ghosh, SRF, UGC Debarpan Mitra, JRF, CNCI Depanwita Saha, JRF, SERB

DR. NABENDU MURMU (HOD & SSO-I)

Objectives of the department:

i. To decipher the correlation between vasculogenic mimicry, angiogenesis and tumour invasiveness in the light of molecular signaling in different cancers.
ii. To examine the role of Ephrin pathway in vasculogenic mimicry in breast and oral cancer progression.
iii. To determine the molecular mechanism of cancer therapeutic and chemopreventive agents in signaling pathways, mRNA transcription and post transcription.
iv. Establishment of RNA binding proteins as therapeutic agents against cancer.
v. To assess the status of p16 and underpin its possible signal transduction pathway in oral premalignant lesions (leukoplakia, erythroplakia, Lichen planus and oral submucous fibrosis) associated with oral squamous cell carcinoma.

Brief description of the work done during the year :

(a) Projects running (Extramural) –

Name of P.I.	**Project Title**	**Funding agency**
Dr. Nabendu Murmu	"Molecular signaling mechanism in oral cancer: Effect of Lupeol in oral squamous cell carcinoma at transcription and post- transcription level."	SERB N. Delhi

(b) Projects running (Intramural) –

Name of P.I.	Project Title	
Dr. Nabendu Murmu	Study on Wnt Pathways as the Signaling Hallmarks of Progressive Oral Squamous Cell Carcinoma in Tobacco and Betel Quid users.	CNCI

(c) Students' Projects running –

Name of the Student	Project Title	Funding agency
Sayantan Bhattacharyya	Molecular Signaling Mechanism in Head and Neck Carcinoma: Synergistic Effect of Lupeol and Ionizing Radiation at Transcription and Post-Transcription Level.	**DST-INSPIRE**
Sudipta Ray	HGF/cMet and EGFR Signaling in Oral Squamous Cell Carcinoma and Lymph Node Metastasis: Effect of Lupeol on these Signaling Pathways *in vitro*.	**UGC**
Paramita Ghosh	Study of mTOR and its downstream target molecules in Gastric cancer patients sample; the effect of chemopreventive agents in Gastric carcinoma cell line and In-vivo model.	**UGC**
Debarpan Mitra	The role of Ephrin and HGF/cMet pathway in regulating vasculogenic mimicry in Breast cancer and possible effects of phytochemicals.	**Institute funded, CNCI**
Depanwita Saha	Molecular signaling mechanism in oral cancer: Effect of Lupeol in oral squamous cell carcinoma at transcription and post- transcription level.	**SERB, New Delhi, sponsored project**

D. Collaborative Projects:

	Name of Scientist	Designation	Affiliation	Name of Project
1	Dr. Prodip Majumder	Chief Scientific Officer	MITRA Biotech, Bangalore	ACCEPT- Accelerated CANScript®-Enabled Personalized Treatment study to measure predictive power of CANScript® for chemotherapeutics in Breast cancer
2	Dr. Prasanta Kumar Maiti	Ex-HOD & Professor	IPGME&R/SSKM Hospital, Kolkata	Evaluation of antimicrobial and anticancer property of bio-compatible novel silver nanoparticles.
3	Dr. Tapan Kumar	Associate	Dept. of Chemistry,	• Application of novel

	Mondal	Professor	Jadavpur university, Kolkata	palladium complex in biological field via live cell imaging.
4	Dr. S. M. Rahman.		Cradle Fertility Centre, Joka, Kolkata	Effect of environmental carcinogens on male fertility and pre-cancerous cellular state in Kolkata and neighbouring areas.

E. Interesting Observations:

I. Molecular signalling mechanism in Oral Cancer: Effect of Lupeol in Oral Squamous Cell Carcinoma at Transcription and Post Transcription Level

Vasculogenic Mimicry (VM) has been identified in the 29.31% of total OSCC patient cohorts. The significant association of VM with the clinico-pathological parameters such as tumor grade, size and lymph-node metastasis has been observed in the studied patient pool. The VM + cohorts exhibited significantly increased expression of the target cMET and Ephrin pathway molecules compared to the VM ones. Moreover the follow-up study also suggested that the VM + group exhibited significantly decreased 5 year disease free (DFS) and overall survival (OS) rate. Furthermore the prognostic significance of the common downstream VM modulator (Laminin 5γ2) has also been established. Individually, VM, Laminin-5γ2 and their subsequent dual expression proved to be independent indicators of prognosis for DFS and OS in OSCC patients. The regulatory role of cMET and Ephrin signaling pathway in modulating VM formation in OSCC has been investigated through the siRNA mediated gene silencing. The knock down of both the major signaling molecules significantly disrupted VM formation as well the other VM associated aggressive property of OSCC cell lines SCC154 and SCC090 indicating their mitigating property in promotion of VM in OSCC. Both of lupeol and the common chemotherapeutic drug paclitaxel individually as well as in a combinatorial manner significantly altered the VM formation, sphere formation, proliferation, clonogenic property, migratory ability along with the induction of apoptotic hallmarks. The treatment of lupeol and paclitaxel successfully downregulated the VM promoting cMET and Ephrin signaling molecules as well as the important epithelial mesenchymal transition (EMT) markers at their translational level. The effect of lupeol and paclitaxel in the in-vitro OSCC cell lines was also validated using Ex-vivo OSCC platform which also reflected the anti VM property of lupeol and paclitaxel through the downregulation of VM associated markers at their translational level.

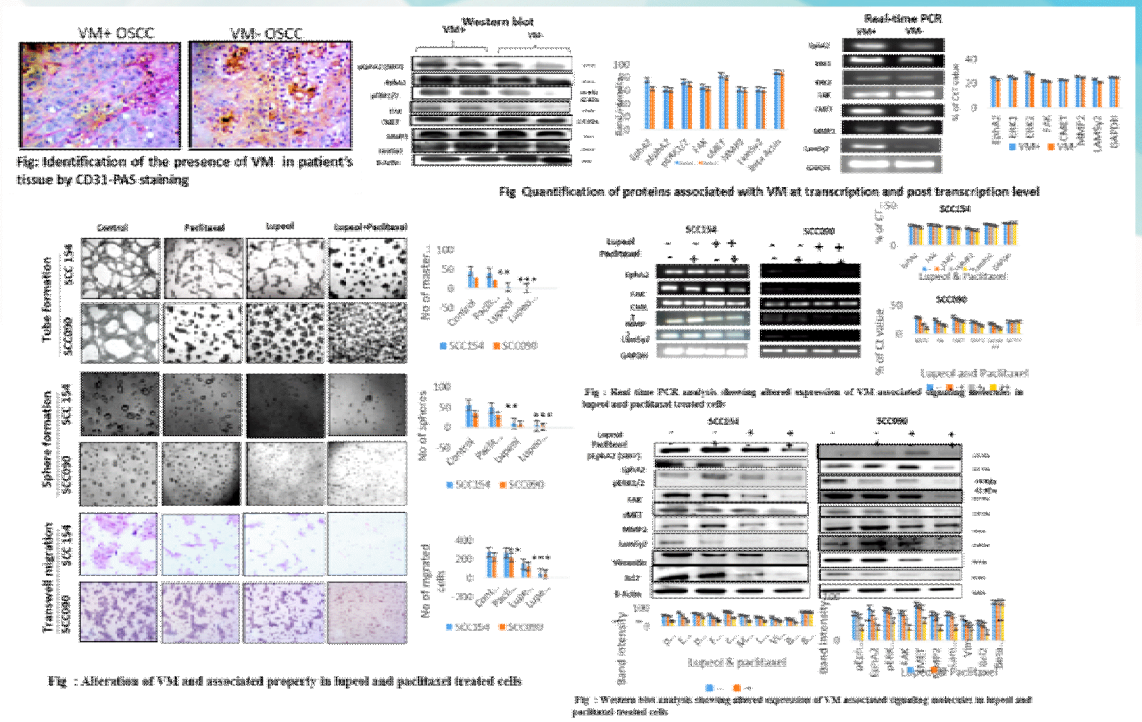


Fig: Identification of the presence of VM in patient's tissue by CD31-PAS staining

Fig Quantification of proteins associated with VM at transcription and post transcription level

Fig : Alteration of VM and associated property in lupeol and paclitaxel treated cells

Fig : Real time PCR analysis showing altered expression of VM associated signaling molecules in lupeol and paclitaxel treated cells

Fig : Western blot analysis showing altered expression of VM associated signaling molecules in lupeol and paclitaxel-treated cells

II. Synergistic effect of lupeol and paclitaxel in inhibiting proliferation and metastasis markers in Oral Squamous Cell Carcinoma ex-vivo model.

We had already investigated the synergistic effect of lupeol and paclitaxel on inhibiting proliferation and metastatic potential of OSCC cell lines UPCI: SCC131 and UPCI: SCC084 in presence of growth factors EGF and HGF. The effect of lupeol and paclitaxel in the in-vitro OSCC cell lines was also validated using Ex-vivo OSCC platform. To evaluate the combinatorial effect of Lupeol and paclitaxel on growth and proliferation markers like EGFR, cMet and COX-2 and on metastatic marker Vimentin in an ex-vivo OSCC model, immunohistochemistry and western blot were performed. Lupeol along with Paclitaxel showed ability to downregulate the expression of both proliferation markers (EGFR, cMet and COX-2) as well as metastatic marker Vimentin in OSCC ex-vivo model at a comparatively lower concentration, thus indicating the efficacy of this combinatorial treatment in comparison to monotherapy.

III. Delineation of the expressional status of EMT related proteins in VM stratified cohort and in vitro evaluation of the effect of the combination of chemotherapeutic drug 5FU and phytochemical Lupeol.

CD-31 PAS staining was performed to stratify the Breast cancer tumour samples into Vasculogenic Mimicry positive and negative cohorts. The samples were probed with molecular markers such as Vimentin, E- cadherin, cMEt and GAB1 by immuno-histochemical methods. Interestingly, it was consistently observed that Vimentin, cMET and GAB1 were overexpressed in the VM positive cohort whereas E-cadherin was overexpressed in the VM negative cohort. This indicates that epithelial to mesenchymal transition of the cancer cells may act as an indicator of VM occurrence and thus subsequent prognosis of the patient. In continuation of our previous work, we treated

MCF-7 and MDA-MB 231 cells with Lupeol and 5FU alone or in combination and performed the TUNEL assay. This revealed that the combination of Lupeol and 5FU is more effective in induction of apoptosis than the common chemotherapeutic drug 5FU and thus may pave the way for a new plethora of cancer therapeutics.

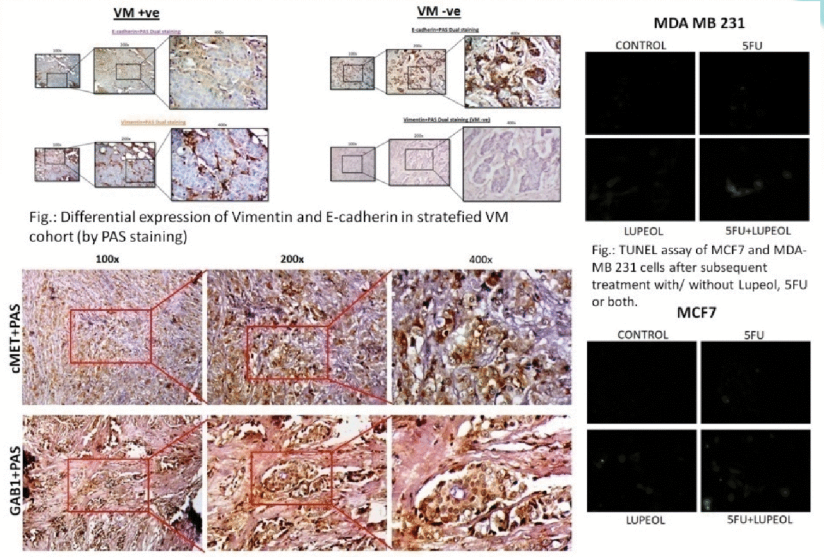


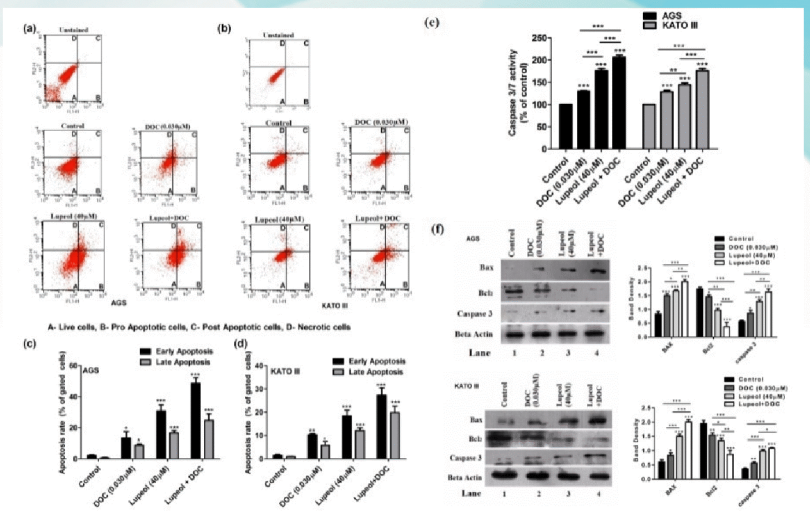
Fig.: Differential expression of Vimentin and E-cadherin in stratefied VM cohort (by PAS staining)

Fig.: TUNEL assay of MCF7 and MDA-MB 231 cells after subsequent treatment with/ without Lupeol, 5FU or both.

Fig.:Expressional status of cMET and GAB1 in VM positive cohort

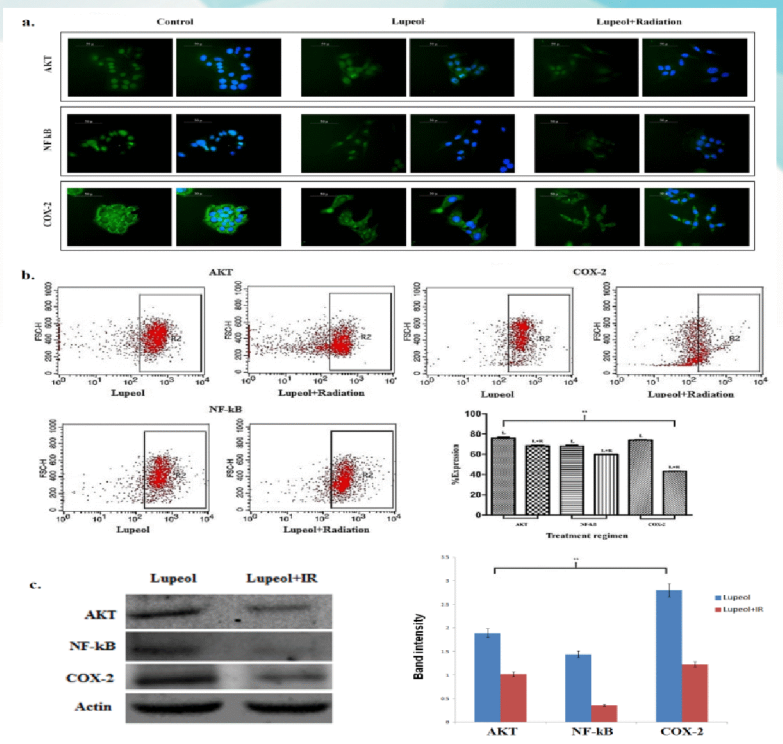
IV. Combinational treatment of lupeol and DOC induces the apoptosis of gastric cancer cells

To gain insight into the mechanisms underlying the anti-proliferative effects of lupeol and DOC which was previously carried out on AGS cells, double labeling technique was utilized using Annexin V-FITC and PI binding, by flowcytometry. Our result revealed that 24 h of treatment with lupeol and DOC markedly enhanced the Annexin V-positive cell population, an apoptotic portion, in gastric cancer cells as compared to control and other treatment regimes. The early and late apoptotic rates were found to be 48.6 % and 24.7 % for AGS and 27.36% and 19.86% for KATO III respectively in lupeol plus DOC treatment**.** To identify the mechanism of apoptosis induction in gastric cancer cells by combination treatment of lupeol and DOC, we investigated the level of protein related to apoptosis. We further confirmed apoptosis by caspase 3/7 activity where combination treatment induces apoptosis in both the cell lines by enhancing the activity of caspase-3 and caspase-7. The action of caspase3 and caspase7 were significantly increased to 48% and 56% in AGS and KATO III respectively as compared to the control and other treatments. Western blot data and its densitometric graph also confirmed the upregulation of caspase 3 protein and pro- apoptotic molecule BAX and down regulation of anti- apoptotic protein Bcl-$_2$ in lupeol plus DOC treatments. Together, these data show that lupeol enhances the activity of DOC synergistically by inducing apoptosis with upregulation of Bax, downregulation of Bcl-2 and activation of caspase-3 in gastric cancer cells at a low concentration as compared to the single treatments.



V. Synergistic effect of Lupeol and Ionizing radiation downregulates the AKT pathway proteins in Head and Neck Cancer cells *in vitro*.

Ionizing radiation (IR) is one of the most conventional treatment regimens for treatment of Head and Neck Squamous Cell Carcinoma (HNSCC). The main objective of this work was to check the synergistic effect of Lupeol along with IR in order to observe if adjuvant treatment of novel phytochemicals like Lupeol with IR shows better efficacy in HNSCC cell lines HEp-2 and UPCI: SCC 131. Result in all experiments showed downregulation of all three proteins (AKT, NF-kB and COX-2). Immunofluorescence staining (a) first revealed qualitative down regulation of oncoproteins (AKT, NF-kB, COX-2) in combined treatment (Lupeol+IR) with respect to Lupeol alone indicating the phytochemical's synergistic effect. Further flow cytometric analysis (b) and W. blot (c) confirmed the findings. Quantitative flow cytometry showed higher efficacy of combined doses of Lupeol and IR for all three oncoproteins. W blot finally confirmed the previous two findings. Data showed downregulation of all proteins in combination treatment with respect to Lupeol alone in HNSCC cell lines.



VI. Effect of novel palladium complex on gastric cancer cell line AGS

Collaborative Project has been carried out with Dept. of Chemistry, Jadavpur University, Kolkata which include the biological application of various novel palladium complex.
The main aim of this study to check the effect of EPM and palladium complex on cell viability and proliferation of gastric cancer cell line. Result revealed that both ligand EPM and palladium complex inhibits the viability of AGS cells in a dose dependent manner. Palladium complex significantly decreases the viability of AGS cells up to 3.9% at its highest concentration as compared to EPM treatments and control. IC_{50} value was calculated using nonlinear regression (curve fit) followed by log (inhibition) vs. response equation in graph pad prism software. IC_{50} value of AGS cells were calculated as 45.40µM and 17.86µM respectively for EPM and Palladium complex respectively. To further confirm the effect of palladium complex on gastric cancer cells colony formation assay was done. After 24 hours of treatment with different concentrations of EPM (22µM) and palladium complex (8µM), decreases in colonies were observed in Palladium complex as compared to EPM and control. Palladium complex at its lowest concentration 8µM reduced the colonies to 16% compared to the control. Together all results indicated that palladium complex reduce the cell viability of gastric cancer cells at its low dose as compared to EPM.

F. Publications / Monographs / Patents etc. (*please mention international and national publications separately*)

International Publications:

- Ray S, Saha D, Alam N, Mitra Mustafi S, Mandal S, Sarkar A, Majumder B, Murmu N. Exposure to chewing tobacco promotes primary oral squamous cell carcinoma and regional

lymph node metastasis by alterations of SDF1α/CXCR4 axis. Int J Exp Pathol. 2021 Apr;102(2):80-92. doi: 10.1111/iep.12386. Epub 2021 Mar 3. PMID: 33655604; PMCID: PMC7981595.

- Bhattacharyya S, Ray S, Saha D, Mustafi SM, Alam N, Sarkar A, Murmu N. Chewing tobacco may act as a risk factor for dysplastic transformation of squamous cells in Oral leukoplakia- A cytochemistry based approach. Pathol Res Pract. 2021 Feb;218:153287. doi: 10.1016/j.prp.2020.153287. Epub 2020 Dec 24. PMID: 33454586.
- Mitra S, Varghese AC, Mandal S, Bhattacharyya S, Nandi P, Rahman SM, Kar KK, Saha R, Roychoudhury S, Murmu N. Lead and cadmium exposure induces male reproductive dysfunction by modulating the expression profiles of apoptotic and survival signal proteins in tea-garden workers. Reprod Toxicol. 2020 Dec;98:134-148. doi: 10.1016/j.reprotox.2020.09.006. Epub 2020 Sep 22. PMID: 32976933.
- Ghosh P, Alam N, Mandal S, Mustafi SM, Murmu N. Association of mTOR pathway with risk of gastric cancer in male smoker with potential prognostic significance. Mol Biol Rep. 2020 Oct;47(10):7489-7495. doi: 10.1007/s11033-020-05808-6. Epub 2020 Sep 11. PMID: 32918126.
- Ghosh P, Mandal S, Mitra Mustafi S, Murmu N. Clinicopathological Characteristics and Incidence of Gastric Cancer in Eastern India: A Retrospective Study. J Gastrointest Cancer. 2020 Aug 18. doi: 10.1007/s12029-020-00478-w. Epub ahead of print. PMID: 32809138.

(d) Other academic activities

Paper presented (Oral / Poster) – N.A.
Ph.D awarded – N.A.
Students undergoing PhD- 6
Conference / Symposium / Workshop (*International / National*) attended –

- 40th Annual Conference of Indian Association for Cancer Research (IACR-2021) organized by Institute of Life Sciences, Bhubaneswar on 1st March, 2021.

Miscellaneous-

1. Dr. Nabendu Murmu acted as reviewer for various international peer reviewed journals.
2. Dr. Nabendu Murmu reviewed several extramural projects submitted to Science and Engineering Research Board, New Delhi.

Dr. Avik Biswas (SSO-II)

Objectives

To investigate the complex role of protein-protein and protein-RNA interactions during viral as well as non-viral cancer development and progression.

Projects running (Extramural)

Title: "*Development of therapeutic peptides for blocking interactions between Hepatitis B and host cellular proteins related with regulatory signaling pathways in hepatocellular carcinoma: A proteomic approach deciphering host-pathogen protein interactive network.*"

DST-SERB (SRG scheme) sponsored project.

Project (ongoing CNCI fund):

Title: "*Study to decipher the molecular basis for protein-protein interactive (PPI) network in Hepatitis B virus (HBV) induced hepatocellular carcinoma (HCC) with special emphasis on the role of HBV x protein*".

Students' Projects running:

1. Title: "*Molecular characterization of complex functional roles of heterogeneous nuclear ribonucleoprotein G (hnRNPG) and heterogeneous nuclear ribonucleoprotein K (hnRNPK) in human hepatocellular carcinoma (HCC)"*.

Name of the Student: Ms. Najma Khatun (UGC-NET JRF).

Funding agency: UGC.

2. Title: *"Deciphering the mechanistic involvement of Hepatitis B virus (HBV) proteins in the progression and regulation of human hepatocellular carcinoma (HCC)"*.

Name of the Student: Ms. Arpita Kar (UGC-NET JRF).

Funding agency: UGC.

3. Title: "*Development of therapeutic peptides for blocking interactions between Hepatitis B and host cellular proteins related with regulatory signaling pathways in hepatocellular carcinoma: A proteomic approach deciphering host-pathogen protein interactive network.*"

Name of the Student: Mr. Abhisekh Samanta [DST-SERB (SRG scheme) sponsored extramural project fellow].

Funding agency: DST-SERB (SRG scheme) sponsored extramural project.

Students undergoing PhD: Two.

Brief description of the ongoing research works

- Role of heterogeneous nuclear ribonucleoprotein G (hnRNPG) and heterogeneous nuclear ribonucleoprotein K (hnRNPK) with special emphasis on RNA recognition motif (RRM) and K-homology domain (for hnRNPG and hnRNPK respectively) in regulation of key cancer signaling candidates (pathways/axis).
- Development of genetic/reverse genetic platforms to study regulatory functions of Heterogeneous nuclear ribonucleoprotein E (hnRNPE1 and hnRNPE2) in human cancers.
- Functional characterization of different HBV proteins (S, X, P and C) and their primary interactions in regulation of human hepatocellular carcinoma (HCC).

Oral presentation

Dr. Avik Biswas delivered invited lecture in the International Webinar organized by Brahmananda Keshab Chandra College. Title of the topic was "Covid-19: Tracing the Origin, Tracing the Challenge" on 13th June, 2020 in the International Webinar on "Role of Biotechnology in combating COVID 19- Issues and Challenges. 11th to 13th June 2020.

Conference/Symposium/Workshop attended

(a) Dr. Avik Biswas attended the International Webinar on "Role of Biotechnology in combating COVID 19- Issues and Challenges 11th -13th June,2020 ".
(b) Dr. Avik Biswas attended "EPI-WIN webinar organized by World Health Organization Information Network for Epidemics (EPI-WIN) Health Emergencies Programme World Health Organization on 3rd February, 2021.
(c) Dr. Avik Biswas attended "40th Annual Conference of Indian Association for Cancer Research (IACR- 2021)" organized by Institute of Life Sciences, Bhubaneswar on 1st March, 2021.
(d) Ms. Najma Khatun, Ms. Arpita Kar and Mr. Abhisekh Samanta attended "40th Annual Conference of Indian Association for Cancer Research (IACR- 2021)" organized by Institute of Life Sciences, Bhubaneswar on 1st March, 2021.

Other activities

Working as the convener of both Institutional Biosafety committee (IBSC-CNCI) and Central Research Instrumentation Facility (CRIF) committee, hence ensuring the smooth operation of both these important segments of the CNCI research wing.

Peer Review:

Dr. Avik Biswas has reviewed several papers for multiple international journals like, Plos One, Scientific Reports, Journal of Advanced Research, etc.

Academic Cell

Academic Coordinator: Dr. Sutapa Mukherjee

Contribution of Other Scientists (Team Members):

Sl No	Name	Designation	Department
1.	Dr Subhadip Hajra	SSO-II	Cancer Chemoprevention
2.	Dr. Ugir Hossain Sk	SSO-II	Clinical and Translational Research
3.	Dr Subhasis Barik	SSO-II	In Vitro Carcinogenesis & Cellular Chemotherapy

Some major noteworthy activities going on in Academic Cell at regular basis are**:** **i).** Conducting and coordinating PhD course work classes **ii).** Placement of students (coming from different institutions and universities) to different departments of CNCI for their training programme. **iii)**. Conducting monthly meeting of the Academic Committee (Research) to resolve Academic issues of Research **iv)**. Evaluation of project proposals by the committee members of the Academic Committee (Research) before submitting the same to extramural funding agencies. V). Fellowship related issues of research fellows.

Department: Animal Care and Maintenance

Head: Abhijit Rakshit, M.V.Sc.
Technical Officer-Animal House

Team

Name	Designation
Shri Shibashis Das	Laboratory Helper
Shri Sambhu Halder (Joined from the Director's Section on 16.09.2020)	Laboratory Helper

Objectives

- To maintain laboratory animals in a clean and hygienic environment
- To produce good quality, healthy animals by adopting scientific breeding techniques
- To provide healthy, disease-free animals to various departments of this Institute for their research work
- To provide technical help in animal experiments
- To organize the Institutional Animal Ethics Committee (IAEC) meetings to scrutinize and guide the animal experimentation projects conducted by different research departments of this Institute
- To supervise ethical aspect of animal experimentation

Brief description of the work done during the year

The Animal Care and Maintenance Department is the central animal facility of the Institute, where Swiss albino and C57BL/6J mice are maintained. A new breeding colony of Balb/c mice for in house use has also been initiated this year.

During the lockdown and unlock phases of the COVID pandemic this department remained open every day and the departmental staffs gave their best effort to maintain the breeding as well as the experimental animals with proper care and hygienic practices. It is because of their sincere effort no great casualty in the animal colony was happened during the lockdown and unlock phases.

This Animal Care and Maintenance Department is registered with the CPCSEA (**C**ommittee for the **P**urpose of **C**ontrol and **S**upervision of **E**xperiments on **A**nimals), Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India, having its Registration No. 1774/GO/RBi/S/14/CPCSEA. Following CPCSEA guidelines two IAEC meetings were held this year. Due to lockdown the first IAEC meeting was held a bit late, on 18th December 2020 and the other one on 27th February 2021. The Annual Inspection of Animal House by CPCSEA Nominee was held on 11th January 2021.

Following is the chart of animals produced and supplied to various departments of the institute in the year 2020-21:

Production

Species	Strain	Male	Female	Total
Mouse	Swiss	252	228	480
	C57BL/6J	308	168	476

Supply

Species	Strain	Male	Female	Total
Mouse	Swiss	181	308	489
	C57BL/6J	168	69	237

DEPARTMENT: Central Research Instrumentation Facility (CRIF)

Name	Designation
Dr. Madhumita Roy	Head, CRIF
Dr. Dona Sinha	Chairperson, CRIF Committee
Dr. Prasenjit Saha	Co-Chairperson, CRIF Committee
Dr. Sankhadeep Dutta	Member, CRIF Committee
Dr. Ugir Hossain	Member, CRIF Committee
Dr. Biswarup Basu	Member, CRIF Committee
Dr. Avik Biswas	Member, CRIF Committee
Mr. Sourin Maity	Senior Scientific Assistant
Mr. Diptendu Ghosh	Technical In charge, Senior Scientific Assistant
Sri Gopal Baur	Contingency Staff

The department of CRIF has provision of several high end scientific instrument including-Atomic absorption spectroscopy, LCMSMS, real time PCR, DNA sequencer, thermal cyclers, genetic analyzer, ELISA Plate Reader, Beta counter system, Chemidoc, , cryo microtome and other histology equipment, LASER capture microdissection microscope, fluorescence microscope, low and high speed cold centrifuges, ultracentrifuge, -86°C deep freezers, analytical electronic balances, UV cross linker, microplate readers, spectrophotometer, fluorimeter, speed-vac system, laminar airflow hood, liquid nitrogen plant, shakers, water purification system etc. A new Live Animal Imaging System has been installed for real time monitoring of fluorescent tags in live animals. CRIF caters the instrumentation amenity for advanced cancer research on a single platform. CRIF maintains Annual Maintenance Contracts (AMC) of the instruments with the service providers. Responsibilities of different equipment has been distributed among the scientists, in order to ensure proper and regular maintenance.

CNCI Library

Name of the department: Library

In-Charge of the department: Name with designation and educational qualification

Research Library and Hospital Library

Name	Designation	Educational qualification
SANMOY CHAKRABORTY	ALIO	M.A., MLIS, M. Phil.
GANESH GORAI	ALIO	B.Sc., MCA, MLIS, M. Phil.

Other staffs of the department (Permanent staffs only)

Name	Designation
GITA KHATUA	GDA

The library service is the pivot of all the academic and clinical activities of the Institute. In one-hand there are Research work carried on in the Research section by the Scientist and Ph. D Fellows and on the other hand there are many academic courses and clinical Researches are conducted in the Hospital site. To cater the needs of all of the above mentioned areas library plays a vital role. The readers and consumers from the above mentioned sectors prefer to get the library service available in all working days.

Objectives of the department

- To collect, organize & disseminate printed & digital information.
- To provide information to the users.
- To develop knowledge house.
- To create and update a comprehensive database of cancer literature.
- To provide online and print journals;
- To provide print and e-books;
- Library offers Online Public Access Catalogue (OPAC) which allows user to browse library collection by author, title, subject, classification number, etc. through web OPAC.
- For help to better research work for Scientist and to better treatment for Doctor.
- In addition it also extended its facilities to other institutions and universities.

Brief description of the work done during the year

1. Library has subscribed to 62 Print & E-Journals for the period April 2020 to December 2020 and 11 Print & E-Journals for the period January 2021 to March 2021.
2. Library has procured UpToData database for clinical decision making online database and I-Thenticate: for checking Plagiarism for clinical and research purpose. .
3. Library automation software KOHA, and institutional repository software DSPACE are running successfully.
4. Library is well equipped with sufficient number of computers with internet connectivity through LAN and wireless networking facility for laptop users. Library is having access to plenty of electronic journals, e-books, archives at institutional level. Online journals are also accessible within the campus through campus LAN.
5. As a member of NCG library provides access to the **Global Clinical Decision** support tool of Elsevier.
6. The library provided the photocopying services to the users.
7. Library provides the newspaper clipping service on news related to cancer.
8. Library also provides e-mail service to the users.
9. The library shares its resources with all important academic/research institutions in India.

Resources

Research Library

No. of Books: 3532

Journals (Online & Print) - 39

No. of Bound Journals: 13824

E Books: 54

Electronic Resources: 212

Hospital Library

Total no. of Books: 6483

Journals (Online & Print) - 23

No. of Bound Journals: 2100

E books: 119

Electronic Resources: 25

Staffs of General Administration, Accounts & Ancillary Departments

Dr. Jayanta Chakrabarti, MBBS, MS, DNB(Surgical Oncology)
Director

Dr. Sankar Sengupta
Medical Superintendent

Dr. D. P. Jena
Administrative Medical Officer

Shri Sudhin Kumar Bandyopadhyay
Senior Administrative Officer

Director's Section

Shri Debanjan Sarkar, Private Secretary
Shri Basanta Mahapatra, Lab. Helper
Shri Sambhu Halder, Lab. Helper

General Administration

Smt. Jyoti Singh, Hindi Officer
Shri Jayanta Sikder, Office Superintendent
Shri Sumit Kr. Majumdar, Office Superintendent
Shri Awadhesh Kumar Singh, Personal Assistant
Shri Prasanta Sarkar, Sr. Caretaker
Shri Ujjwal Kr. Barui, Head Clerk
Shri Sailesh Kr. Singh, LDC (PwD)
Smt. Soma Das, Storekeeper
Shri Malay Das, Daftari
Smt. Arati Dey, GDA
Shri Monojit Das, UDC
Shri Jagannath Das, Gardener

Accounts Section

Shri Chandan Kumar Sinharay, Accounts Officer
Shri Shaibal Bhaduri, Assistant Accounts Officer
Shri Debraj Das, Assistant Accounts Officer
Shri Atal Behari Mahanti, Accountant
Shri Sunil Kr. Jha, Accountant
Shri Animesh Nath, Accountant
Shri Asitava Bhattacharya, LDC
Shri Rambilash Yadav, Lab. Helper
Shri Ujjal Roy, UDC
Shri Dipak Malik, GDA
Smt. Punia Devi, GDA

Ward Master's Section

Shri Bhola Pal, Lab. Helper
Shri Sarju Das, GDA
Shri Asim Kumar Chakravarty, GDA
Smt. Saraswati Nayak, GDA
Smt. Sumitra Routh, GDA
Shri Purnendu Roy, GDA.
Shri Karunakar Nayak, GDA
Smt. Sumitra Das, GDA
Smt. Rekha Gachhit, GDA
Shri Rabin Pramanik, GDA
Shri Sanjoy Das, GDA
Shri Krishan Mallik, GDA
Shri Harihar Nayak, GDA
Shri Tapan Saha, GDA
Shri Shankar Naskar, GDA
Smt. Munni Hela, GDA
Smt. Jhuma Lama, GDA
Shri Dipak Biswas, GDA
Shri Sara Nayak, GDA

Maintenance Department

Shri Swarup Ghosh, AC Attendant
Shri Bidesh Roy, Electrician (PwD)

Store and Purchase

Shri Subhasish Chakraborty, T.O.-(Store & Purchase)
Shri Samson Soren, Store Supervisor
Shri Ganesh Kundu, GDA

Academic and Computer Facility

Dr. Sutapa Mukherjee, Academic Coordinator

Shri Kalyan Shankar Roy Chowdhury T.O.-Scientific

Shri Ranjit Singh, Telephone Operator

Nursing Staff

Smt. Malika Barui(Mukherjee), Asst. Nursing Supdt.

Smt. Dalia Biswas, Nursing Sister

Smt. Krishna Dey, Nursing Sister

Smt. Bandana Chakraborty, Nursing Sister

Smt. Rita Rana, Nursing Sister

Smt. Krishna Roy Chowdhury, Nursing Sister (Retired on 31.01.2021)

Smt. Japamala Maity, Nursing Sister

Smt. Rita Dutta, Nursing Sister

Smt. Uma Majumder, Nursing Sister

Smt. Priya Bhattacharya, Nursing Sister

Smt. Tanu Ghosh (Chanda), Nursing Sister

Smt. Swati Ghosal, Nursing Sister

Smt. Alpana Maity, Nursing Sister

Smt. Tapati Burman, Nursing Sister

Smt. Sujata Majumder, Staff Nurse

Smt. Debjani Dutta (Debangshi), Staff Nurse

Smt. Purnima Mondal (Sarkar), Staff Nurse

Smt. Kabita Ghosh (Bali), Staff Nurse

Smt. Soma Chatterjee (Mukherjee), Staff Nurse

Smt. Piyali Bandyopadhyay, Staff Nurse

Smt. Kabita Bera (Maity), Staff Nurse

Smt. Sandhya Das, Staff Nurse

Smt. Tapati Ghosh, Staff Nurse

Smt. Manjula Tudu, Staff Nurse

Smt. Runa Sanyal, Staff Nurse

Smt. Sonali Bhunia, Staff Nurse

Smt. Sharmila Das, Staff Nurse

Smt. Sarbani Das, Staff Nurse

Smt. Arpita Dey (Das), Staff Nurse

Smt. Rumi Dutta (Sarkar), Staff Nurse

Smt. Chirosree Sarkar (Mukherjee), Staff Nurse

Smt. Bijali Mondal, Staff Nurse

Smt. Samita Saha, Staff Nurse

Smt. Banhishikha Das, Staff Nurse

Smt. Sarmila Kora, Staff Nurse

Smt. Kakoli Bhattacharjee, Staff Nurse

Smt. Moushumi Chakraborty(Choudhuri), Staff Nurse

Smt. Baranali Sarkar, Staff Nurse

Smt. Soma Jana, Staff Nurse

Smt. Krishna Singha, Staff Nurse

Smt. Kumkum Sarkar (Bhowmick), Staff Nurse

Smt. Pamela Maity (Chowdhuri), Staff Nurse

Smt. Rekha Sardar, Staff Nurse

Smt. Sipra Pal, Staff Nurse

Smt. Chaitali Mondal (Guha), Staff Nurse

Smt. Ratna Karmakar, Staff Nurse

Smt. Jayita Das, Staff Nurse

Shri Om Prakash, Staff Nurse

Shri Kamal Singh Choudhury, Staff Nurse

Smt. Sudeshna Bag, Staff Nurse

Smt. Sikha Jana, Staff Nurse

Smt. Beauty Pradhan, Staff Nurse

Smt. Arpita Mukherjee, Staff Nurse

Shri Suresh Kumar, Staff Nurse

Shri Naveen Tailor, Staff Nurse

Shri Mukesh Kumar, Staff Nurse

Smt. Nitu Kumari, Staff Nurse

Smt. Sonali Nath, Staff Nurse

Shri Rajpal Raigar, Staff Nurse

Shri Sitaram, Staff Nurse

Shri Kuldeep Meena, Staff Nurse

Shri Suraj Mal, Staff Nurse

Smt. Nagamani Gudala, Staff Nurse

Shri Kuldeep, Staff Nurse

Chittaranjan National Cancer Institute

(An Autonomous Body under Ministry of Health & Family Welfare, Govt. of India)

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2ND CAMPUS :

Street Number 299, DJ Block, Action Area 1D, New Town, Kolkata - 700 156, Phone : 033- 2324 5010 / 11

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