Mahitosh Mandal . Ph D, FRSB, FNA, FNSc, FNASc, FNAScT
Arvind & Renu Jain Chair Professor and J C Bose National Fellow .

1. Name: Mahitosh Mandal

2. Current Position and Address: Professor, School of Medical Science and Indian Institute of Technology, Kharagpur
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   Visiting Associate Professor - Human and Molecular Genetics
   Virginia Commonwealth University Medical Center, Richmond, USA

3. Educational Qualification :

Sl No	Degree/Certificate	Year of Passing	University/ Institute	Subject
1	Ph D	1994	Indian Institute of Chemical Biology, Jadavpur University, Kolkata, India	Science
2	M Sc	1985	Calcutta University	Human Physiology
3	B Sc (Hons)	1983	Calcutta University	Human Physiology (Hons) Chem, Zoo (Pass)
4	Higher Secondary (12+2)	1979	West Bengal Board of Higher Secondary Education	Eng, Beng, Phy, Chem, Biology, Math
5.	Secondary (10)	1977	West Bengal Board of Secondary Education	Eng, Beng, Sansk, Math, Phy Sc, Life Sc, Hist, Geo, Work Education

4. Academic/ Research Experience/ Employment

Sl No	From	To	Name of Organization	Position held
1	2018	Present	Indian Institute of Technology Kharagpur	Professor
2	2010	2018	Indian Institute of Technology Kharagpur	Associate Professor
3	2006	2010	Indian Institute of Technology Kharagpur	Assistant Professor
4	2003	2006	MD Anderson Cancer Center, USA	Assistant Professor
5	1999	2003	MD Anderson Cancer Center, USA	Research Scientist
6	1998	1999	MD Anderson Cancer Center, USA	Research Associate
7	1995	1998	MD Anderson Cancer Center, USA	Post Doctoral Fellow

5. Areas of Specialization :
   Cancer Biology.
   Signal Transduction,
   Drug discovery,
   Targeted Drug Delivery.
   Mechanism of Chemo and Radio resistance.
   Reproductive Biology

6. Honors/ Awards/Recognitions received :
   Arvind & Renu Jain Chair Professor
   Fellow of Royal Society, Biology (FRSB)
   JC Bose National Fellow:
   Fellow: The Indian National Science Academy (FNA),
   Fellow: Indian Academy of Sciences (FNSc),
   Fellow: T he National Academy of Sciences, India (FNASc),
   Fellow: West Bengal Science Academy . (FNAScT)

Basanti Devi Amir Chand Award by ICMR, India 2018
Prof S S Katiyar Endowment Award by Indian Science Congress.
Subha Mukherjee Memorial Award by Physiological Society of India.
National Scholarship from Govt of West Bengal

7. Professional Affiliations :

*(a) **List of Research Publication including popular articles.**

Total Publication: 225. Total Citation - 16244 : h Index- 69 (as per Google Sclolar)

1. Roy PK, Majumder R, **Mandal M.** In-silico identification of novel DDI2 inhibitor in glioblastoma via repurposing FDA approved drugs using molecular docking and MD simulation study **J Biomol Struct Dyn.***2023 May 3:1-12. doi: 10.1080/07391102.2023.2204371.* ***IF- 5.23***

2. Das S, Kundu M, Hassan A, Parekh A, Jena BC, Mundre S, Banerjee I, Yetirajam R, Das CK, Pradhan AK, Das SK, Emdad L, Mitra P, Fisher PB, **Mandal M.** A novel computational predictive biological approach distinguishes Integrin β1 as a salient biomarker for breast cancer chemoresistance. **Biochim Biophys Acta Mol Basis Dis.** 2023 Apr 10;1869(6):166702**. IF- 6.63**

3. Baindara P, Chowdhury T, Roy D, **Mandal M**, Mandal SM. Surfactin-like lipopeptides from Bacillus clausii efficiently bind to spike glycoprotein of SARS-CoV-2. J Biomol Struct Dyn. 2023 Apr 6:1-12. doi: 10.1080/07391102.2023.2196694. **IF- 5.23**

4. Kundu M, Das S, Das CK, Kulkarni G, Das S, Dhara D, **Mandal M.** Magnolol induces cytotoxic autophagy in glioma by inhibiting PI3K/AKT/mTOR signaling**. Exp Cell Res.** 2023 Feb 1;424(1):113488. **IF- 3.9**

5. Chaudhuri A, Singha T, Jena BC, Shee M, Datta PK, **Mandal M**, Singh NDP. A two-photon responsive hydroxyphenylquinazolinone (HPQ)-based fluorescent organic nanoprodrug for H2S release against oxidative stress. **Chem Commun** (Camb). 2023 Jan 11. doi: 10.1039/d2cc05768a. **IF- 6.06**

6. Kola P, Nagesh PKB, Roy PK, Deepak K, Reis RL, Kundu SC, **Mandal M. I**nnovative nanotheranostics: Smart nanoparticles based approach to overcome breast cancer stem cells mediated chemo- and radioresistances. **Wiley Interdiscip Rev Nanomed Nanobiotechnol.** 2023 Jan 4:e1876. doi: 10.1002/wnan.1876. **IF- 10.86**

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8. Ghosh T, Nandi S, Bhattacharyya SK, Ghosh SK, **Mandal M**, Banerji P, Das NC. Nitrogen and sulphur doped carbon dot: An excellent biocompatible candidate for in-vitro cancer cell imaging and beyond. **Environ Res.** 2022 Nov 23;217:114922. doi: 10.1016/j.envres.2022.114922. **IF- 7.64**

9. Bhattacharya K, Kundu M, Das S, Samanta S, Roy SS, **Mandal M**, Singha NK. Glycopolymer Decorated pH-Dependent Ratiometric Fluorescent Probe Based on Förster Resonance Energy Transfer for the Detection of Cancer Cells. **Macromol Rapid Commun**. 2022 Oct 27:e2200594. doi: 10.1002/marc.202200594. **IF- 5.73**

10. Mandal M, Banerjee I, **Mandal M.** Nanoparticle-mediated gene therapy as a novel strategy for the treatment of retinoblastoma. Colloids Surf B Biointerfaces. 2022 Oct 4;220:112899. **IF-5.26**

11. Deepak K, Roy PK, Kola P, Mukherjee B, **Mandal M.** An overview of kinin mediated events in cancer progression and therapeutic applications. **Biochim Biophys Acta Rev Cancer**. 2022 Sep 24;1877(6):188807. **IF- 10.68**

12. Choudhary NK, Mittapelli LL, Kumar Roy P, Das G, **Mandal M**, Gore KR. Vinyl substituted triphenylamine based turn-off fluorescent probe for selective and sensitive detection of mercury (II) in water and live cells. **Spectrochim Acta A Mol Biomol Spectrosc**. 2022 Sep 17;285:121887. **IF- 4.8**

13. Parekh A, Das S, Das CK, **Mandal M.** Progressing Towards a Human-Centric Approach in Cancer Research. Front Oncol. 2022 Jul 19;12:896633. doi: 10.3389/fonc.2022.896633

14. Biswas A, Rajesh Y, Das S, Banerjee I, Kapoor N, Mitra P, **Mandal M.** Therapeutic targeting of RBPJ, an upstream regulator of ETV6 gene, abrogates ETV6-NTRK3 fusion gene transformations in glioblastoma. **Cancer Lett.** 2022 Jul 3;544:215811. doi: 10.1016/j.canlet.2022.215811. **IF- 8.679**

15. Bhattacharya K, Das S, Kundu M, Singh S, Kalita U, **Mandal M**, Singha NK. Gold Nanoparticle Embedded Stimuli-Responsive Functional Glycopolymer: A Potential Material for Synergistic Chemo-Photodynamic Therapy of Cancer Cells. **Macromol Biosci**. 2022 Jul 7:e2200069. doi: 10.1002/mabi.202200069. **IF- 4.97**

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17. Jena BC, Das CK, Banerjee I, Bharadwaj D, Majumder R, Das S, Biswas A, Kundu M, Roy PK, Kundu CN, **Mandal M. T**GF-β1 induced autophagy in cancer associated fibroblasts during hypoxia contributes EMT and glycolysis via MCT4 upregulation. **Exp Cell Res**. 2022 May 11;417(1):113195. doi: 10.1016/j.yexcr.2022.113195. **IF- 3.9**
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19. Dey A, Kundu M, Das S, Jena BC, **Mandal M.** Understanding the function and regulation of Sox2 for its therapeutic potential in breast cancer. **Biochim Biophys Acta Rev Cancer** 2022 Mar;1877(2):188692. **IF- 10.68**
20. Biradha K, Saha S, Maity K, Roy PK, **Mandal M.** Comparative Study of Nitro and Azide Functionalized Zn(II) based Coordination Polymers as Fluorescent Turn-on Probes for Rapid and Selective Detection of H2S in Living Cells. **Chemistry**. 2021 Dec 22. doi: 10.1002/chem.202103830. **IF- 5.235**
21. Majumder R, Das CK, Banerjee I, Chandra Jena B, Mandal A, Das P, Pradhan AK, Das S, Basak P, Das SK, Emdad L, Fisher PB, **Mandal M.** Screening of the Prime bioactive compounds from Aloe vera as potential anti-proliferative agents targeting DNA. **Comput Biol Med**. 2021 Nov 19:105052. **IF- 4.589**
22. Chandra Jena B, Sarkar S, Rout L, **Mandal M.** The transformation of cancer-associated fibroblasts: Current perspectives on the role of TGF-β in CAF mediated tumor progression and therapeutic resistance. **Cancer Lett**. 2021 Nov 1;520:222-232. **IF- 8.679**
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24. Das P, Majumder R, **Mandal M**, Basak P. In-Silico approach for identification of effective and stable inhibitors for COVID-19 main protease (M pro) from flavonoid based phytochemical constituents of Calendula officinalis. **J Biomol Struct Dyn**. 2021 Oct;39(16):6265-6280. **IF- 3.39**

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temozolomide resistance in glioblastoma. **Proc Natl Acad Sci U S A.** 2020 Jun 2;117(22):12324-12331. **IF- 12.29**

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35. Bharadwaj D, **Mandal M.** Senescence in polyploid giant cancer cells: A road that leads to chemoresistance. **Cytokine Growth Factor Rev**. 2020 Apr;52:68-75. **IF- 7**

36. Roy B, Kundu M, Singh AK, Singha T, Bhattacharya S, Datta PK, **Mandal M**, Singh NDP. Stepwise dual stimuli triggered dual drug release by a single naphthalene based two-photon chromophore to reverse MDR for alkylating agents with dual surveillance in uncaging steps. **Chem Commun (Camb).** 2019 Oct 29;55(87):13140-13143. **IF- 6.22**

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40. Das CK and **Mandal M**. Pro-survival Autophagy: An Emerging Candidate of Tumor Progression through Maintaining Hallmarks of Cancer**. Semin Cancer Biol.** 2019 Aug 17. pii: S1044-579X(19)30020-3 . **IF-11.39**

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44. Rajesh Y, Banerjee A, Pal I, Biswas A, Das S, Dey KK, Kapoor N, Ghosh AK, Mitra P, **Mandal M.** Delineation of crosstalk between HSP27 and MMP-2/MMP-9: A synergistic therapeutic avenue for glioblastoma management. **Biochim Biophys Acta** Gen Subj. 2019 Jul;1863(7):1196-1209. **IF-3.67**

45. Sen K, Banerjee S, **Mandal M**. Dual drug loaded liposome bearing apigenin and 5-Fluorouracil for synergistic therapeutic efficacy in colorectal cancer. **Colloids Surf B Biointerfaces**. 2019 Aug 1;180:9-22. **IF-5.17**

46. Paul A, Biswas A, Sinha S, Shah SS, Bera M, **Mandal M**, Singh NDP. Push-Pull Stilbene: Visible Light Activated Photoremovable Protecting Group for Alcohols and Carboxylic Acids with Fluorescence Reporting Employed for Drug Delivery. **Org Lett**. 2019 May 3;21(9):2968-2972. **IF- 6.49**

47. Pal I, Rajesh Y, Banik P, Dey G, Dey KK, Bharti R, Naskar D, Chakraborty S, Ghosh SK, Das SK, Emdad L, Kundu SC, Fisher PB, **Mandal M.** Prevention of epithelial to mesenchymal transition in colorectal carcinoma by regulation of the E-cadherin-β-catenin-vinculin axis. **Cancer Lett.** 2019 Jun 28;452:254-263. **IF- 8.679**

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50. Banerjee I, De M, Dey G, Bharti R, Chattopadhyay S, Ali N, Chakrabarti P, Reis RL, Kundu SC, **Mandal M** *. A peptide-modified solid lipid nanoparticle formulation of paclitaxel modulates immunity and outperforms dacarbazine in a murine melanoma model. **Biomater Sci.** 2019 Feb 26;7(3):1161-1178. **IF-6.84**

51. Das CK, Jena BC, Banerjee I, das S, Parekh A, Bhutia SK, **Mandal M** *. Exosome as a Novel Shuttle for Delivery of Therapeutics across Biological Barriers.. **Mol Pharm**. 2018 Dec 4. doi: 10.1021. **IF- 4.9**

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List Of Extramural Projects:

Ongoing:

1. J C Bose Fellowship from SERB from Oct 2019- Oct 2024: 95lacks

2. DECIPHERING THE ROLE OF HMGB1 IN MODULATING THERAPY-RESISTANCE IN GLIOBLASTOMA VIA METABOLIC ALTERATION , ICMR, New Delhi, India. 2021- 2024. 51.10 lacks , Role PI

3. ESIGN OF A HIGH-THROUGHPUT PREDRUG SCREENING TECHNIQUE FROM DETRIMENTAL PROTEIN INTERACTION NETWORKS AND EXPERIMENTAL VALIDATION ON GLIOBLASTOMA. ICMR, New Delhi, India. 2021- 2024. 20.31 lacks , Role Co-PI

4. ENGINEERED NANO HYDROGEL FOR TARGET SPECIFIC DELIVERY IN SQUAMOUS CELL CARCINOMA. APEX COMMITTEE OF SPARC(,MHRD, NEW DELHI). 2019- 2021. 48.88 lacks , Role PI

5 Design and therapeutic elucidation Of Novel Small Molecule Inhibitor Targeting ETV6-NTRK3 associated gene fusion in glioblastoma. Indian Council of India , New Delhi 2019-2022.: 51.24 lacks Role - PI.

6. Evaluation of Resveratrol loaded nanoparticle on apoptosis in oral cancer stem cells by crosstalking through Hedgehog-GlI and WNT-TCF cascade. Indian Council of India , New Delhi 2019-2022. 27 lacks Role – PI

7. Nano-platform Based Carboplatin Delivery in Retinoblastoma by Modulating Blood-Retinal Barrier. CSIR, India 18.9 lacks 1-9-2019 - 30-5-2022. Role PI .

8 CUSTOMIZED BIOACTIVE POROUS TITANIUM IMPLANTS WITH IMPROVED TISSUE-INTEGRATION AND ATTENUATED ASEPTIC LOOSENING FOR ORTHOPAEDIC APPLICATIONS. DRDO, India. 65.41 lacks. 24-04-2019- 23-04-2022. Role CO PI

9. PHOTORESPONSIVE NANOCONJUGATES FOR EFFICIENT COMBINATION CHEMOTHERAPY : SEQUENTIAL AND COCKTAIL APPROACHES. SERB, India. 46.2 lacks. 12-10-2018- 11-10- 2021 . Role Co- PI

10. SYNTHESIS, SOLUTION PROPERTIES AND IN VITRO EVALUATION OF STIMULI-RESPONSIVE POLYMER-BASED PRODRUG SYSTEM. SERB. , India.38.99 lacks. 15-03-2018- 14-03-2021. Role- Co PI.

Completed:

11. COMBINING METFORMIN AND METRONOMIC LIPOSOMAL CHEMOTHERAPEUTIC FORMULATION FOR EFFECTIVE MANAGEMENT OF MULTIPLE CANCERS. SERB. India. 19.2 lacks. 18-04-2017- 17-04-2018. Role PI

12. PILOT SCALE STUDY ON LOCAL INHABITANTS REDUCTION OF FEAR TO AAI PROGRAMME AS PAR DEMAND OF LOCAL ADMINISTRATION. Airport Authority of India. 39.98 lacks . 12-08-2016- 11-08-2019. Role PI

13. DEALING WITH THE CANCER OF CERVIX: ENHANCING THE EFFICACY OF IONIZING RADIATION WITH GOLD NANOPARTICLE: Department of Atomic Energy, Bombay, India. 33.14 lacks . 15-7-2015 - 31-03-2019. Role PI

14. ENGINEERED SILK MATRICES FOR OPTIMIZATION OF IN VITRO 3 D TUMOUR MODEL: Indian Council of Medical Research, New Delhi, India. 49.31 lacks. Ongoing 1-1-2014- to 30-6-2018 , Role PI

15. Unraveling Cancer Transformation and Progression through Biological, Electro-Mechanical and Computational Techniques: MHRD, New Delhi, India, 38 lacks.15-4-2014 to 14-4-2017. **Role - PI**

16..Natural Silk Protein Based Modification Of Orthopedic Implant To Improve Osteogenesis And Osseo-Integration; Dept of Biotechnology, New Delhi, India. 49.38 lacks. 18-12-2014 to 17-12-2017, **Role PI**

17. Delivery of Drugs and cells to the cornea using silk protein A novel therapeutic approach.Dept of Biotechnology, New Delhi, India, 21.74 lacks, 29-12-2014-28-12-2017. **Role : PI**

18. EVALUATION OF S100A7 (PSORIASIN) AS AN EARLY DETEDTION MARKER OF CELL CARCINOMA. Department of Science and Technology, New Delhi, India. 34.82 lacks. 1-11-2009 to 30-04-2012

19. ENHANCED PRODUCTION, PURIFICATION AND CHARACTERIZATION OF MARINE BACTERIAL LIPOPEPTIDE AS POTENTIAL BROAD-SPECTRUM ANTIMICROBIAL AND ANTICANCER AGENT FOR BREAST CANCER THERAPY. Ministry of Earth Science, New Delhi, India 10036800.00.lacks. 9-8-2010 to 31-12-2013.

20. SEQUENCE DEPENDENT MOLECULAR ACTION OF ZD6474 WITH PACLITAXEL AND RADIATION IN PROGRESSION AND TREATMENT OF BREAST CANCER. Department of Biotechnology, New Delhi, India.31.5 lacks. 28-03-2011 to 31-12-2014

21. DETERMINING THE MECHANISMS OF S100A7 (PSORIASIN) IN MEDIATING ANOIKIS RESTANCE AND TUMOR PROGRESSION IN SQUAMOUS CELL CARCINOMA OF THE ORAL CAVITY. MDRD, New Delhi, India. 27-04-2007 to 30-04-2007

22. STUDY OF EXTRACELLULAR FIBRILLAR BIOPOLYMERS NATURAL SILK FIBRES SILK PROTEIN SCAFFOLDS AND PROTEOGLYCAN FIBRIL OF BOTH MUCUS AND EXTRACELLULAR MATRIX TISSUE. DST, New Delhi, India. 15.25 lacks 1-08-2009 to 31-08-2011. Role CO PI

23. INDIAN ORIGIN SILK BASED BIOMIMETIC SCAFFOLDS FOR ENGINEERING OF LOAD BEARING TISSUE. DBT, New Delhi, India.34.13 lacks. 1-04-2011 to 16-09-2014. Role CO- PI

24. DEVELOPMENT OF DENSE AND POROUS TITANIUM COMPONENTS VIA POWDER METALLURGY ROUTE FOR BIOMEDICAL APPLICATIONS. DRDO, India. 19-03-2012 to 18-03-2015. 67.23 lacks. Role CO PI

25. INVOLVEMENT OF FUNCTIONAL SINGLE NUCLEOTIDE POLYMORPHISMS (SNP) OF MATRIX METALLOPROTEINASE (MMP) GENE PROMOTERS IN THE CELL TYPE SPECIFIC REGULATION OF HUMAN MMPS: INTRINSIC GENETIC CHARACTERISTICS IN CANCER CELL PROGRESSION. DBT, New Delhi, India. 05-03-2013 to 06-09-2016. 52.57 lacks. Role PI

Teaching:

Medical Biotechnology,

Human Physiology and Anatomy,

Cancer Biology,

Immuno technology,

Biology of Living System

Awards:

JC Bose Fellow:

Fellow: The Indian National Science Academy (FNA),

Fellow: Indian Academy of Sciences (FNSc),

Fellow: The National Academy of Sciences, India (FNASc),

Fellow: West Bengal Sicence Academy . (FNAScT)

Basanti Devi Amir Chand Award by ICMR, New Delhi 2018

Prof S S Katiyar Endowment Award by Indian Science Congress.

Subha Mukherjee Memorial Award by Physiological Society of India.

National Scholarship from Govt of West Bengal

Service rendered to Other Institutions and Organizations.

1. Visiting Faculty, VCU (Virginia Commonwealth University), Richmond, USA
2. EC Member of Indian Association of Cancer Research.
3. Member of Board of Studies : Vidyasagar University, Barasat University, Jhargram University, Physiology Department, Midnapore College.
4. Member of NAAC (National Assessment and Accreditation Council)
5. Sectional Committee Member of West Bengal Science Academy (WAST)
6. Life Member Indian Physiological Society of India.
7. Associate Member of American Cancer Society, USA.
8. Member Indian Science Congress.
9. Editorial Board Member - Scientific Report.
10. Editorial Board Member of Journal of Biological Engineering.
11. Reviewer of so many journals like: Oncogene, Cancer Letters, BBRC, BBA, Molecular Cancer Therapy, Cancer Research, Nanomedicine, etc.
12. Ph D Thesis evaluation of Different Institute like IIT Delhi, IIT Madras, Delhi University, KIIT, etc
13. Grant evaluations: SERB, DST, DBT, ICMR, etc

Institute Administrative Activities

1 Examination-in-Charge Departmental Examination time Table Incharge 01-03-2010 31-12-2020 10 years 10 mons

2 Others Departmental Time Table Incharge 01-03-2010 31-12-2020 10 years 10 mons

3 Others Course Co-Ordinator of Molecular Medical Microbiology (M Sc Course with Tata Medical Center) 01-05-2018 03-05-2021 3 years 3 days

4 Others MEMBER, PURCHASE COMMITTEE, School of Medical Science and Technology 08-09-2016 13-09-2019 3 years 6 days

5 Others MEMBER, DEPARTMENTAL ACADEMIC COMMITTEE(PG & R), School of Medical Science and Technology 08-09-2016 13-09-2019 3 years 6 days

6 Others MEMBER, DEPARTMENTAL ADMINISTRATIVE COMMITTEE, School of Medical Science and Technology 08-09-2016 13-09-2019 3 years 6 days

7 Others LABORATORY INCHARGE(CANCER BIOLOGY), School of Medical Science and Technology 27-04-2006 31-12-2027 21 years 8 mons 4 days

8 Others PG TABULATOR, School of Medical Science and Technology 27-07-2016 30-04-2022 5 years 9 mons 5 days

(c) **Highlights of contributions to the area of specialization**

Cancer is leading cause of mortality worldwide and we are yet to find a cure for the malady. Goal of our lab is to exploit strategic weakness of signalling networks in cancer and identify novel therapeutic targets. We have been engaged in extensive research focusing various aspect of cancer biology, both basic and applied, and are ever expanding our horizons, the main areas of interest being cancer therapeutics, drug delivery, therapeutic resistance and diagnostics. The team is a heterogeneous group working in concert with members having knowledge in cell and molecular biology, microbiology, bioinformatics, pharmacy, biochemistry, biotechnology and chemoinformatics; constantly exploring new chemotherapeutic agents from both natural and synthetic sources and of late has diversified to promising adjuvant therapies like cancer immunotherapy, photothermal therapy etc. In the field of Drug delivery systems, we developed several targeted delivery systems like liposomes, exosomes and a variety of nanopatricles. In an attempt to redesign these nano-carriers for homing at cancer targets, we are evaluating several possible biomarkers and their efficacy in targeted therapy. Despite rapid advancement in strategies, therapeutic resistance is the major hindrance in cancer treatment. We are trying to decipher the molecular mechanisms promoting radio and chemo resistance in cancer. In this regard, we are exploring novel avenues like cancer stem cells, autophagy and epigenetics to disrupt the regulatory mechanisms promoting resistance. To fulfil the objectives of our research those are the few projects we will focus in our laboratory for next five years.

a) **The anti-cancer potentiality of Different Natural bioactive compounds in cancers (project funded by DBT, DST, Govt of India):** Honey has been used since long time both in medical and domestic needs, but only recently the antioxidant property of it came to limelight. Honey possesses anti-inflammatory, antioxidant and antitumor properties and we have shown that honey as a potential chemotherapeutic agent against colon cancer (Invest New Drugs. 2010 ,J Biomed Biotechnol. 2009;). Coadministration of thymoquinone (TQ) and TAM resulting in a substantial increase in breast cancer cell apoptosis and marked inhibition of cell growth both in vitro and in vivo. Anti-angiogenic and anti-invasive potential of TQ and TAM was assessed through in vitro studies. This novel combinatorial regimen leads to regulation of multiple cell signaling targets including inactivation of Akt and XIAP degradation (PLoS One. 2013). Effect of Akt inhibition by TQ is proven by translational repression through deregulated phosphorylation of 4E-BP1, eIF4E, S6R and p70S6K.Our observations for the first time may provide a new insight for the development of novel therapies for Akt overexpressed breast cancer by TQ (Life Sci. 2013). Therapeutic implication of 'Iturin A' for targeting MD-2/TLR4 complex to overcome angiogenesis and invasion, Oxidative stress triggered by naturally occurring flavone apigenin results in senescence and chemotherapeutic effect in human colorectal cancer cells (Redox Biology 2015). Developing new classes of anticancer molecules has always been a major scientific challenge owing to multidrug resistance of cancer cells to conventional chemotherapeutic agents. Microbial amphiphiles, particularly lipopeptides and glycolipids, have recently emerged as potential new-generation anticancer agents, owing to low toxicity, high efficacy and easy biodegradability. Marine lipopeptide Iturin A inhibits Akt mediated GSK3β and FoxO3a signaling and triggers apoptosis in breast cancer.(Drug Discovery Today 2015, Scientific Report 2015, Cell Signaling 2017).

b) Study the anti-cancer potentiality of Different synthetic compounds and existing drugs in different cancers (project funded by DBT, DST, BRNS Govt of India) ZD6474 a dual kinase inhibitor has potential for the targeted therapy of breast cancer. Collectively, our studies indicate that incorporating an anti-EGFR plus VEGFR strategy (ZD6474) with chemotherapy (paclitaxel), where clinical studies of dose-intensive paclitaxel therapy are currently in progress, may be more effective in treating patients with locally advanced or metastatic breast cancer than either approach alone. our studies also indicate that incorporating an anti-EGFR plus VEGFR strategy (ZD6474) with phototherapy (UV-B), an alternative approach to the ongoing conventional radiotherapy for the treatment of infiltrating metastatic breast cancer cells in the skin and for locally recurrence breast cancer than either approach alone (Mol Cancer. 2013, J Cell Physiol. 2011, Cancer Biol Ther. 2010) . BI-69A11 a novel AKT inhibitor enhances the antitumour efficacy of Ad.5/3-mda-7 on Colo Rectal Cancer (CRC) overexpressing K-RAS by inducing apoptosis and regulating Akt activity thereby warranting further evaluation in treating CRC (BJC-2014). We also generated a novel combination therapy by pretreatment with CQ that inhibited the autophagy and accelerated the apoptotic potential of BI-69A11. In summary; our findings suggest that induction of autophagy lead to the resistance of colon cancer towards BI-69A11 mediated apoptosis Eur J Pharmacol. 2015). This present study demonstrates GW627368X, a highly selective competitive EP4 antagonist, which hinders cervical cancer progression by inhibiting EP4/epithelial growth factor receptor (EGFR) interactive signaling. GW627368X reduced protein kinase A (PKA) phosphorylation which in turn leads to decreased cAMP response element-binding protein (CREB) activation. Decreased PKA phosphorylation also directly enhanced Bax activity and in part reduced glycogen synthase kinase 3 (GSK3)β phosphorylation(Cell Death and Diseases- 2016)

c) Preparation of different types of drug conjugated nanoparticle for targeted drug delivery and study its anti-cancer activity as well as anti-angiogenesis potentiality (project funded by DBT, DST, BRNS Govt of India). The effects of celecoxib-loaded nanoparticles on colon cancer cell proliferation, morphology, cytoskeleton, cellular uptake and apoptosis were analysed in vitro. Additional in vivo studies demonstrated significantly greater inhibition of tumor growth following treatment with this modified nanoparticle system. The present study indicates a promising, effective and safe means of using celecoxib, and potentially other therapeutic agents for colon cancer therapy (Biomaterials. 2011). 3D in vitro model systems that are able to mimic the in vivo microenvironment are now highly sought after in cancer research. Fibroin scaffold can provide an easily manipulated microenvironment system to investigate individual factors such as growth factors and signaling peptides, as well as evaluation of anticancer drugs (Biomaterials. 2011). Tamoxifen administration enhanced overall disease-free survival and diminished mortality rates in cancer patients. However, patients with breast cancer often fail to respond for tamoxifen therapy due to the development of a drug-resistant phenotype. In this study, we fabricate a mesoporous silica gold cluster nanodrug delivery system that displays exceptional tumor-targeting capability, thus promoting accretion of drug indices at the tumor site..Overall, results with these silica gold nanoclusters suggest that they may be a potent nanoformulation against chemoresistant cancers (Mol Pharm. 2018). The promising safety, targeting, and therapeutic results of systemic delivery of ZD6474 by AuNM provide an attractive alternative method for treating patients with metastatic breast cancer which we published in Langmuir. 2017. Reduction responsive nanorod embedded micelle containing folic acid and lipoic acid when treated on cervical cancer cells or tumour bearing mice, aggregate in and around cancer cells. Due to high glutathione concentration, micelles degrade releasing drug which binds surface receptors inducing apoptosis. When incident with 808nm cwNIR lasers, gold nanorods bring about photothermal effect leading to hyperthermic cell death by necroptosis. Combination of the two modalities enhances therapeutic efficacy by inducing both forms of cell death. Our proposed treatment strategy achieves photothermal therapy and targeted drug delivery simultaneously. It can prove useful in overcoming general toxicities associated with chemotherapeutics and intrinsic/acquired resistance to chemo and radiotherapy (BBA 2017).

e) Pro-survival autophagy and cancer cell resistance to therapy9 project funded by DBT, DST, BRNS Govt of India): Resistance to therapy is one of the prime causes for treatment failure in cancer and recurrent disease. In recent years, autophagy has emerged as an important cell survival mechanism in response to different stress conditions that are associated with cancer treatment and aging.A better understanding of the interplay of cancer therapy and autophagy may allow to unveil new targets and avenues for an improved treatment of therapy-resistant tumors in the foreseeable future (Cancer Metastasis Rev. 2018). Target-specific treatment modalities are currently not available for triple-negative breast cancer (TNBC), and acquired chemotherapy resistance is a primary obstacle for the treatment of these tumors. BAG3 Overexpression and Cytoprotective Autophagy Mediate Apoptosis Resistance in Chemoresistant Breast Cancer Cells (Neoplasia. 2018). Although there is a strong correlation between multinucleated cells (MNCs) and cancer chemo-resistance in variety of cancers, our understanding of how multinucleated cells modulate the tumor micro-environment is limited. We captured multinucleated cells from triple-negative chemo-resistant breast cancers cells in a time frame, where they do not proliferate but rather significantly regulate their micro-environment. We show that oxidatively stressed MNCs induce chemo-resistance in vitro and in vivo by secreting VEGF and MIF. These factors act

through the RAS/MAPK pathway to induce chemo-resistance by upregulating anti-apoptotic proteins. In MNCs, elevated reactive oxygen species (ROS) stabilizes HIF-1α contributing to increase production of VEGF and MIF. Together the data indicate, that the ROS-HIF-1α signaling axis is very crucial in regulation of chemo-resistance by MNCs. Targeting ROS-HIF-1α in future may help to abrogate drug resistance in breast cancer (Oncogene. 2018). We also hypothesize that analysis of growth rate, death resistance and cellular energy, through bioimpedance based analysis can be used to determine and compare aggressiveness of multiple cancer cell lines. This further opens avenues for extrapolation of present work to human tumor tissue samples (Sci Rep. 2018).

f**) A snapshot of IL-6 mediated involvement in cancer Development (project funded by DBT, DST, BRNS Govt of India).:** Interleukin-6 (IL-6) is a cytokine present in tumor microenvironment. Elevated level of IL-6 is associated with cancer cell proliferation, angiogenesis and metastasis through fueling STAT3, MAPK and Akt signaling(Cancer Letters 2016). Selective targeting to the tumor niche remains a major challenge in successful cancer therapy. Somatostatin receptor 2 (SSTR2) is overexpressed in breast cancer cells thus making this receptor an attractive target for selective guidance of ligand-conjugated drug liposomes to the tumor site. In this study, a synthetic somatostatin analogue (SST) was used as SSTR2 targeting agent and Diacerein was employed as therapeutic molecule. In vivo pharmacokinetic studies in rats showed enhanced circulation time in the DNL or SST-DNL treated groups as compared to free DN. Considering all of these findings, we conclude that SST-DNL provides a novel strategy with better efficacy for breast cancer therapy (Cancer Letters 2017). Interleukin-6 (IL-6) signaling network has been implicated in oncogenic transformations making it attractive target for the discovery of novel cancer therapeutics. We have investigated the potent antiproliferative and apoptotic effect of diacerein against breast cancer. The in vivo antitumor effect was correlated with decreased proliferation (Ki-67), increased apoptosis (TUNEL) and inhibition of IL-6/IL-6R-mediated STAT3, MAPK and Akt pathway in tumor remnants. Taken together, diacerein offered a novel blueprint for cancer therapy by hampering IL-6/IL-6R/STAT3/MAPK/Akt network (Oncogene 2016). Selective targeting to the tumor niche remains a major challenge in successful cancer therapy. Somatostatin receptor 2 (SSTR2) is overexpressed in breast cancer cells thus making this receptor an attractive target for selective guidance of ligand-conjugated drug liposomes to the tumor site. In this study, a synthetic somatostatin analogue (SST) was used as SSTR2 targeting agent and Diacerein was employed as therapeutic molecule. Diacerein loaded liposomes (DNL) were prepared and they were further decorated with the synthetic and stable analogue of somatostatin (SST-DNL).In vivo pharmacokinetic studies in rats showed enhanced circulation time in the DNL or SST-DNL treated groups as compared to free DN. Considering all of these findings, we conclude that SST-DNL provides a novel strategy with better efficacy for breast cancer therapy (Cancer Letters- 2017). Monoamine oxidases (MAO) are mitochondrial enzymes functioning in oxidative metabolism of monoamines. The action of MAO-A has been typically described in neuro-pharmacological domains. Here, we have established a co-relation between IL-6/IL-6R and MAO-A and their regulation in hypoxia induced invasion/angiogenesis. (BJC 2018).

10. * **Number of Books authored/edited**:

1. Chandan Kanta Das, Ranabir Majumder, Pritam Roy, and **Mahitosh Mandal**. The Intricacy of ROS in Cancer Therapy Resistance.Page 1220-1235. Springer Nature Singapore . 2022

2 Y.Rajesh, Utkarsh Kumar and Mahitosh Mandal. Therapeutic aspects of heat shock proteins in glioma: Cementing the crevasses between bench and bedside. Springer Nature Heat Shock Proteins in Neuroscience, (2019).

3. Y Rajesh, M Mandal. Regulation of extracellular matrix remodeling and epithelial-mesenchymal transition by matrix metalloproteinases: decisive candidates in tumor progression.(2017) Proteases in Physiology and Pathology, 159-194. Springer, Singapore

4. K. Banerjee K , Banerjee S, **Mandal M**. Book entitled: Biological and Pharmaceutical Applications of Nanomaterials. Liposomes as a drug delivery system. Edited by P. Prokopovich. CRC Press. 2015

5 Parida S and **Mandal M.** Anti-Angiogenesis Drug Discovery and Development Mechanism of Controlling Blood Vessel Growth and Development and Identification of Therapeutics Against Pathological Angiogenesis, Vol-2 page 3-62,2014. Bentham Science Publishers

6. Kumar S and **Mandal M**, Anti cancer Activity of Honey and its Phenolic components, 2011. Published by Nova Science Publishers Inc, New York, USA

7. Sarkar S and **Mandal M**, Breast Cancer: Classification Based on Molecular Etiology Influencing Prognosis and Prediction Page-69-84, 2011 "Breast Cancer - Focusing Tumor Microenvironment, Stem cells and Metastasis, ISBN 978-953-307-766-6, edited by Mehmet Gunduz and Esra Gunduz & published by InTech publishers.

8 .Majumder GC, ..., **Mandal M and et al ,** Biochemical role of cell surface molecules in the regulation of sperm flagellar movement. Endocrinology and Male Reproductive Biology to be published by PHI Learning Private Limited, Connaught Circus, New Delhi, 2010.

9 Majumder G.C., **Mandal M**. and Banerjee S.: A Novel Sperm Motility-promoting Protein from Blood Serum and Its Applied Potential. In *Recent Advances in Animal Science Research* (Eds. SK Ghosal & D Ray), Orion Press International, Chandernagore, West Bengal, Vol. I, pp. 61-67 (2001).

10. Majumder GC, Roy N, **Mandal M**, Banerjee S. Anti-sticking factors and regulators of sperm motility. Proceedings of the International Conference on “Frontiers in Reproductive Physiology”, Wiley Publishers, 193-210, 1992.

11. * **Number of Patents/ Copy rights/Trade Mark/IPR granted/applied for & highlights of translation research contributions:** Annexture V

In India

a)A process for the purification of a new motility-promoting protein from buffalo serum: A slaughter house waste by G.C. Majumder, M. Mandal and S. Banerjee. Patent No 185383; Issue Date: August 3 , 2001; Filing Date: March 17, 1997.

b)Anti Bacterial Hydrogel Composition and Application Thereof : Filed (Ref : 708/KOL/2013)

c)System for cytoreduction of circulating cancer cells from blood and a method thereof: P. Chhatrala, S Paridha and M Mandal, 686/KOL/2015

In USA

A process for the purification of a new motility-promoting protein from buffalo serum: A slaughterhouse waste by G.C. Majumder, M. Mandal and S. Banerjee.US Patent No 6613737; Issue Date: September 2, 2003; Filing Date: March 10, 1998.

In Japan

A process for the purification of a new motility-promoting protein from buffalo serum: A slaughterhouse waste by G.C. Majumder, M. Mandal and S. Banerjee. Japan Patent No 3251545; Issue Date: November16, 2001; Filing Date: March 6, 1998.

12. **Dissertations supervised:**

(a) **List of PhD Students (Completed)**

1..Saravana Kumar Jaganathan: Title of Thesis Characterization of Indian honey and its anticancer activity against colon cancer. Roll No 06MM9402. Year Awarded : 2010

2. Siddik Sarkar: Title : The Molecular Effect of ZD6474, a Dual Tyrosine Kinase Inhibitor of Epidermal Growth Factor Receptor and Vascular Endothelial Growth Factor Receptor on Breast Cancer Progression and Treatment: Roll No- 07MM9701.Year Awarded : August 2011

3. Joydip kundu: Title: Silk fibroin and sericin protein based matrices for tissue engineering and drug delivery. Roll No- 06BT9710 Year Awarded : 2011

4. Venkatesan perumal: Title of Thesis: Nanocarrier (Liposome/Nanoparticle) Mediated Drug (Celecoxib) Delivery in Colon Cancer. Roll No: 07MM9401. Year Awarded: 2011

5.Sankar ramachandran: Purification and characterization of azurin from Pseudomonas aeruginosa MTCC 2453 and its effects in breast carcinoma . Roll No- 07MM9602. Year Awarded : 2011

6. Swatilekha Maity. Title:A bioactive reactive protein fraction from Edible Mushroom Pleurotus Osteatis (Jacq.) P. Kumn. and its efficacy in cancer Therapy. Roll No- 08MM9701 Year Awarded: 2011

7 .Shashi Rajput. Title: Elucidating the Molecular Mechanism of Thymoquinone, a dietary Phytochemicals, for Breast Cancer Treatment. Roll No: 09MM9704; Year Awarded : 2014

8. Bhusetty Nagesh Prashanth Kumar. Title: Targeing Vascular Endothelial Growth Factor Signaling Augments tamoxifen Therapy and Overcomes Its Resistance in Breast cancer. Roll No- 10MM9704: Year Awarded 2015

9. Ipsita Pal. Title: BI-69A11, A Novel Akt Inhibitor, Exerts Anti-tumor Effects In Colon Carcinoma By Modulating Akt and Its Downstream Signaling To Potentiate Current Therapeutic Efficacy Roll No- 10MM90F02. Year Awarded 2015

10. Kacoli Banerjee. Title: APIGENIN AND ITS NANO-LIPOSOMAL FORMULATION FOR COLORECTAL CANCER AND BACTERIAL CHEMOTHERAPY . Roll No- 10MM90F03 Year Awarded 2015

11. Kaushik Kumar Dey. Title : Proteomics Based Identification of Early Detection Biomarker and Oncogenic Role of S 100A7 in Oral Cancer. Roll No- 10MM90P01 Year Awarded 2016

12. Sheetal Parida Title: Combining EP4 Prostanoid Receptor Inhibition with Photothermal Therapy for Effective Treatment of Cervical cancer. Roll No- 11MM91F01. Year Awarded 2017

13. Goutam Dey: Title: Therapeutic Potential and Pre-clinical Risk Assessment of Bacterial Lipopeptide 'Iturin A' in Breast Cancer. Roll No- 10MM90P04. Year Awarded 2017

14. Deboki Naskar. Title: Non- Mulbery Silk Fibroin Based Biomaterials for Load Bearing Tissue Regeneration. Roll No- 12BT91P01. Year Awarded 2018

15. Rashmi Bharti: Title: Therapeutic Implication of IL-6/ IL-6 Receptor Targeting Agents Diacerin in Breast carcinoma. Roll No- 11MM92F04. Year Awarded 2018

16. Aditya Parekh. Title: Deciphering the role of Multinucleated cells in Breast cancer Chemo-resistance Roll No- 11MM92P02. Year Awarded 2018

17. Y Rajesh . Title:Molecular Targeting of Heat Shock Proteins and Matrix Metalloproteinases For Globlastoma Therapeutics. Roll No- 13MM91F01. Year Awarded 2019

18. Chandan Kanta Das . Title: pro-survival autophagy regulates breast cancer chemoresistance". Roll No- 13MM91F02. Year Awarded 2019

19. Payel Banik: Title of thesis: MATRIX METALLOPROTEINASE 3 MODULATES ACQUIRED RADIORESISTANCE IN BREAST CANCER. Roll No- 13MM91P04. Yaer of Award 2022.

20. Subhayan Das . Title: Deciphering the Molecular Mechanisms of Chemoresistance in Breast Cancer. Roll No- 14MM91 R09. Year of Award -2022

21. Bikash Chandra Jean. Title- Modulation of Tumor Microenvironment during Chemoresistance for Breast Cancer Progression. Roll No- 14MM92F01. Year of Award 2022

22. Angana Biswas. Title - Elucidation of RBPJ kappa transcription factor mediated regulation of ETV6 gene: ETV6-NTRK3 fusion gene modeling and Inhibition in glioblastoma. Roll No-15MM91R03. Year of Award 2022

23.Deblina Bharadwaj . Title-Role of polyploid giant cells in the modulation of tumor microenvironment in breast cancer. Rool No-15MM91R02. Year of Award 2022

24. Moumita Kundu . Title-Revealing the Potential of Magnolol in glioma: a natural anti glioma agent from Magnolia.. Roll No-16MM92R03. Year of Award 2022

On Going Ph Student (10). 1.Ranabir Majumder. 2.Pritam Roy. 3. Sherya Banerjee 4. Madhurima Mandal 5 Ankita Dey 6. P Kola 7 Suvendu Nandi. 8. Sucharita Patra 9. Deeepak K .10. Priya Ghosh

(**b) Post-Graduation: Master Students Supervision: total No- 20 completed**