

DR. ANIRUDDHA BANERJI

Designation: Assistant Professor

Post Graduate Department of Biotechnology,
St. Xavier's College (Autonomous),
30, Mother Teresa Sarani, Kolkata-700016.

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Qualifications

- B. Sc (Zoology Hons.), (1st class 1st), University of Calcutta.
- M. Sc. (Zoology), (1st class 1st, Gold Medallist), University of Calcutta.
- Ph. D. (Life Sciences), Jadavpur University. Research pursued at Chittaranjan National Cancer Institute, Kolkata.
- Qualified NET (CSIR-JRF), (2000)

Areas of Interest

Primary area of research interest: Cancer biology

- Study of cell surface receptors (integrins, EGFR) and their roles in tumour biology.
- Study of cellular signalling pathways which are dysregulated in cancer to promote invasion and metastasis.
- Study of matrix metalloproteinases (MMPs) and the crucial roles they play in tumour invasion and metastasis.
- Study of the anti-tumorigenic and anti-invasive effects of natural compounds and the molecular mechanisms by which such effects are exerted.

Additional areas of research and academic interest include:

- Wildlife biology: Study of biodiversity and conservation.
- Evolutionary biology: Study of human, mammalian and vertebrate evolution.
- Animal behaviour and ecology
- Genetics and genetic analysis
- Comparative anatomy
- Environmental biology

Honours and Awards

- Aparajita Memorial Medal, awarded by Presidency College, Kolkata for 1st place in B. Sc Zoology (Hons.), 1998.
- A.K. Bhowmick Memorial Medal, awarded by The Zoological Society, Kolkata for 1st place in B. Sc Zoology (Hons.) 1998, University of Calcutta.
- Medal from Calcutta University, for 1st place in M. Sc Zoology 2000, University of Calcutta.

- Adjudged Best Young Scientist in Molecular Biology and Genetics, at National Seminar on Dimensions in Zoological Research in Human Welfare, organized by Dept. of Zoology, University of Calcutta and The Zoological Society, Kolkata in collaboration with Zoological Survey of India, 2007.
- Award for Best Oral Presentation, at Symposium on Recent Trends in Cancer Research & Treatment, organized by Chittaranjan National Cancer Institute Golden Jubilee celebration, 2007.
- Included in India Cancer Researcher Database (ICRD), supported by the Department of Biotechnology, Government of India, 2011 onwards.
- Elected as Member of the Executive Committee, Zoological Society, Kolkata, 2015–2019.
- Elected as Member of the Sectional Committee of the Section of New Biology, Indian Science Congress, 2019-2020 and 2020-21.

List of Publications

Journals

- 1) **A. Banerji**. Membrane type matrix metalloproteinases – importance in tumour biology. *Science and Culture* (2004) vol. 70 pp. 105-107.
- 2) A. Mitra, J. Chakrabarti, **A. Banerji**, A. Chatterjee. Binding of $\alpha 2$ monoclonal antibody to human cervical tumor cell (SiHa) surface $\alpha 2\beta 1$ integrin modulates MMP-2 activity. *Gynecologic Oncology* (2004) vol. 94(1) pp. 33-39.
- 3) **A. Banerji**, J. Chakrabarti, A. Mitra, A. Chatterjee. Effect of curcumin on gelatinase A (MMP-2) activity in B16F10 melanoma cells. *Cancer Letters* (2004) vol. 211(2) pp. 235-242.
- 4) **A. Banerji**, J. Chakrabarti, A. Mitra, A. Chatterjee. Cell membrane-associated MT1-MMP-dependant activation of pro-MMP-2 in A375 melanoma cells. *Journal of Environmental Pathology, Toxicology and Oncology* (2005) vol. 24(1) pp. 3-17.
- 5) A. Mitra, J. Chakrabarti, **A. Banerji**, S. Das, A. Chatterjee. Culture of human cervical cancer cells, SiHa in the presence of fibronectin activates MMP-2. *Journal of Cancer Research and Clinical Oncology* (2006) vol. 132(8) pp. 505-513.
- 6) A. Mitra, J. Chakrabarti, **A. Banerji**, A. Chatterjee. Cell membrane-associated MT1-MMP dependent activation of MMP-2 in SiHa (human cervical cancer) cells. *Journal of Environmental Pathology, Toxicology and Oncology* (2006) vol. 25(4) pp. 655-666.
- 7) J. Chakrabarti, A. Mitra, **A. Banerji**, A. Chatterjee. Culture of human fibrosarcoma HT-1080 cells in presence of fibronectin activates MMP-2. *Journal of Environmental Pathology, Toxicology and Oncology* (2006) vol. 25(4) pp. 667-677.
- 8) A. Mitra, J. Chakrabarti, **A. Banerji**, A. Chatterjee, B.R. Das. Curcumin, a potential inhibitor of MMP-2 in human laryngeal squamous carcinoma cells HEP2. *Journal of Environmental Pathology, Toxicology and Oncology* (2006) vol. 25(4) pp. 679-690.
- 9) S. Das, **A. Banerji**, E. Frei, A. Chatterjee. Rapid expression and activation of MMP-2 and MMP-9 upon exposure of human breast cancer cells (MCF-7) to fibronectin in serum free medium. *Life Sciences* (2008) vol. 82(9-10) pp. 467-476.

- 10) **A. Banerji**, S. Das, A. Chatterjee. Culture of human A375 melanoma cells in the presence of fibronectin causes expression of MMP-9 and activation of MMP-2 in culture supernatants. *Journal of Environmental Pathology, Toxicology and Oncology* (2008) vol. 27(2) pp. 135-145.
- 11) S. Moulik, T. Sen, A. Dutta, **A. Banerji**, C. Ghosh, S. Das, A. Chatterjee. Phosphatidylinositol 3-Kinase and NF- κ B Involved in Epidermal Growth Factor-Induced Matrix Metalloproteinase-9 Expression. *Journal of Cancer Molecules* (2008) vol. 4(2) pp. 55-60.
- 12) T. Sen, S. Moulik, A. Dutta, P.R. Choudhury, **A. Banerji**, S. Das, M. Roy, A. Chatterjee. Multifunctional effect of epigallocatechin-3-gallate (EGCG) in downregulation of gelatinase-A (MMP-2) in human breast cancer cell line MCF-7. *Life Sciences* (2009) vol. 84(7-8) pp. 194-204.
- 13) A. Dutta, T. Sen, **A. Banerji**, S. Das, A. Chatterjee. Studies on Multifunctional Effect of All-Trans Retinoic Acid (ATRA) on Matrix Metalloproteinase-2 (MMP-2) and Its Regulatory Molecules in Human Breast Cancer Cells (MCF-7). *Journal of Oncology* (2009) vol. 2009 Article ID 627840, 13 pages.
- 14) G. Maity, S. Fahreen, **A. Banerji**, P. Roy Choudhury, T. Sen, A. Dutta, A. Chatterjee. Fibronectin-integrin mediated signaling in human cervical cancer cells (SiHa). *Molecular and Cellular Biochemistry* (2010) vol. 336(1-2) pp. 65-74.
- 15) **A. Banerji**. The gelatinases and their role in tumour invasion. *International Journal of Biology, Pharmacy and Allied Sciences* (2012) vol. 1(7) pp. 1003-1011.
- 16) S. Das, I. Guha, A. Chatterjee, **A. Banerji**. Anti-cancer Potential of All-trans Retinoic Acid (ATRA): A Review. *Proceedings of the Zoological Society* (2013) vol. 66(1) pp. 1-7.
- 17) **A. Banerji**, A. Majumder, A. Chatterjee. Stem Cells and Cancer: the Cancer Stem Cell (CSC) Model. *Journal of Tumor* (2015) vol. 3(3) pp. 349-355.
- 18) **A. Banerji**, A. Majumder. All-Trans Retinoic Acid Downregulates Epidermal Growth Factor Receptor Mediated Regulation of Matrix Metalloproteinase-2 in B16F10 Murine Melanoma Cells. *Annual Research & Review in Biology* (2016) vol. 10(5) pp. 1-8.
- 19) A. Majumder, **A. Banerji**. Epidermal Growth Factor Receptor Regulates Matrix Metalloproteinase-2 Activity in MDA-MB-231 Human Breast Cancer Cells. *British Biotechnology Journal* (2016) vol. 16(1) pp. 1-9.
- 20) **A. Banerji**. The Collagenases: Key Molecules In Tissue Remodelling. *Aviskaar: A Xaverian Journal of Research* (2017) vol. IX pp. 13-20.
- 21) **A. Banerji**. Man and his ancestors – the legacy and fate of Neanderthal Man. *Current Science* (2018) vol. 114(7) pp. 1394-1396.
- 22) A. Majumder, S. Ray, **A. Banerji**. Epidermal growth factor receptor-mediated regulation of matrix metalloproteinase-2 and matrix metalloproteinase-9 in MCF-7 breast cancer cells. *Molecular and Cellular Biochemistry* (2019) vol. 452(1-2) pp. 111–121.
- 23) **A. Banerji**. Tigers and Conservation in India: Literary Attempts at Creating Awareness. *Magis – Xaverian Journal of Education* (2020) vol. IX pp. 53-60.

Book Chapters

- 1) A. Mitra, J. Chakrabarti, **A. Banerji**, S. Das, A. Chatterjee. Tumor Cell Surface Integrins and Metallomatrix Proteinases (MMPs) Cross-talk : A Potential Area for Developing Anti-Metastatic Drugs. *Current Trends in Pharmacology*, pub: I.K. International Publishing House Pvt. Ltd., New Delhi (2007) pp. 437-441; ISBN: 81-88237-77-9.
- 2) S. Das, **A. Banerji**, E. Frei, A. Chatterjee. Culture of human breast cancer cells (MCF-7) in presence of fibronectin in serum free medium activates MMP-2 and MMP-9. *Proceedings of the 4th International Conference on Tumor Microenvironment: progression, therapy and prevention*, pub: Medimond International Proceedings. Bologna, Italy (2007) pp. 117-127; ISBN: 9788875873462.
- 3) **A. Banerji**, J. Chakrabarti, A. Mitra, A. Chatterjee. Cell Surface Activation of MMP-2. *Zoological Research in Human Welfare*, pub: Zoological Survey of India, Kolkata, (2008) pp. 235-244; ISBN: 978-81-8171-201-1.
- 4) **A. Banerji**. Endocrine Disrupting Compounds (EDCs): The Risks for Aquatic Fauna. *Current Strategies in Biotechnology and Bioresource Technology Vol. 2*, pub: Book Publisher International (2020) pp.149-155; Print ISBN: 978-93-89816-88-4, eBook ISBN: 978-93-89816-89-1.
- 5) **A. Banerji**, K.K. Ganguly, A. Chatterjee. All-trans Retinoic Acid (ATRA), a Potential Inhibitor of Matrix Metalloproteinase-2 (MMP-2) and Tumour Invasion in Melanomas. *Current Strategies in Biotechnology and Bioresource Technology Vol. 2*, pub: Book Publisher International (2020) pp.156-168; Print ISBN: 978-93-89816-88-4, eBook ISBN: 978-93-89816-89-1.
- 6) **A. Banerji**, P. Ghoshal. Agricultural Production and Climate Change: The Scope for Innovation in the Post-COVID 19 Scenario. *Current Strategies in Biotechnology and Bioresource Technology Vol. 2*, pub: Book Publisher International (2020) pp.169-176; Print ISBN: 978-93-89816-88-4, eBook ISBN: 978-93-89816-89-1.
- 7) A. Majumder, S. Ray, **A. Banerji**. Phosphatidylinositol 3' Kinase (PI3K), A Crucial Regulator of Epidermal Growth Factor Receptor (EGFR) Modulated MMP-2, MMP-9 and MT1-MMP Expression in Breast Cancer Cells. *Recent Progress in Microbiology and Biotechnology Vol. 2*, pub: Book Publisher International (2020) pp. 165-174; Print ISBN: 978-93-90206-62-9, eBook ISBN: 978-93-90206-59-9

Invited talks/ Papers Presented at Conferences/ Seminars

- 1) Presented paper "Modulation of gelatinase A/ matrix metalloproteinase-2 activity by curcumin" at *Annual Meeting of Immunology Study Group, West Bengal*, organized at Chittaranjan National Cancer Institute, Kolkata, Jan 16th, 2004.
- 2) Presented paper "Effect of curcumin on MMP-2 activity in B16F10 cells" at the *Scientific Seminar for the selection of Sudev Bhushan Ghosh Young Scientist Award (2005-06)*, organized by The Zoological Society, Kolkata, July 21st, 2006.

- 3) Presented paper “The role of cell surface integrins (fibronectin receptor) in regulation of expression and activity of matrix metalloproteinases (MMPs)” at *International Conference on Frontier Researches in Integrative Physiology* organized by Dept. of Physiology, University of Calcutta, Jan 8th–10th, 2007.
- 4) Presented paper “Integrin–Matrix Metalloproteinases (MMPs) Cross Talk” at *26th Annual Convention of Indian Association for Cancer Research and International Symposium on Translational Research in Cancer* organized by Institute of Life Sciences, Bhubaneswar and Imgenex India Pvt. Ltd., Bhubaneswar, Jan 17th–19th, 2007.
- 5) Presented paper “Cell surface activation of MMP-2” at *National Seminar on Dimensions in Zoological Research in Human Welfare* organized by Dept. of Zoology, University of Calcutta and The Zoological Society, Kolkata in collaboration with Zoological Survey of India, Mar 23rd–25th, 2007.
- 6) Presented paper “Effect of curcumin on MMP-2 activity in B16F10 murine melanoma and HEP2 human laryngeal cancer cells” at *Symposium on Recent Trends in Cancer Research & Treatment*, organized by Chittaranjan National Cancer Institute Golden Jubilee celebration, Nov 1st–3rd, 2007.
- 7) Presented paper “Climate Change and Agriculture: Implications on Food Security” at *1st St. Xavier’s Global Earth Summit* organized by Dept. of Environmental Studies, St. Xavier’s College (Autonomous), Kolkata, Mar 11th–12th, 2011.
- 8) Presented paper “Anti-tumorigenic Potential of Curcumin and ATRA” at D.S.T. (Govt. of India) sponsored *Sir J.C. Bose Memorial National Symposium on Modern Trends in Animal Science Research and Challenges of the Day*, organized by Presidency University, Kolkata, Mar 23rd–25th, 2011.
- 9) Presented paper “Role of $\alpha 5\beta 1$ integrin (fibronectin receptor) in modulation of MMP-9 and MMP-2 activity in A375 melanoma cells” at *99th Indian Science Congress (Section: New Biology)* organized by The Indian Science Congress Association at Bhubaneswar, Jan 3rd–7th, 2012.
- 10) Delivered invited lecture “Role of cell surface receptors in modulation of MMP activity in human cancer cells” at *102nd Indian Science Congress (Section: New Biology)* organized by The Indian Science Congress Association at Mumbai, Jan 3rd–7th, 2015.
- 11) Delivered invited lecture “Effect of All-Trans Retinoic Acid (ATRA) on Receptor Mediated Modulation of Matrix Metalloproteinase-2 (MMP-2) in Murine Melanoma Cells” at *106th Indian Science Congress (Section: New Biology)* organized by The Indian Science Congress Association at Jalandhar, Punjab, Jan 3rd–7th, 2019.
- 12) Delivered invited lecture “Epidermal Growth Factor Receptor (EGFR): A Potent Regulator of Matrix Metalloproteinases (MMPs) and Tumour Invasion in Breast Cancer” at *107th Indian Science Congress (Section: New Biology)* organized by The Indian Science Congress Association at Bengaluru, Karnataka, Jan 3rd–7th, 2020.
- 13) Delivered invited lecture “Improving Cancer Therapeutics: The Potential of Curcumin and ATRA” at *International Conference on Chemistry for Human Development (ICCHD-2020)*

organized by Professor Asima Chatterjee Foundation, Kolkata, University of Calcutta and Heritage Institute of Technology at Kolkata, Jan 9th-11th, 2020.

As Resource Person

- 1) Co-chaired session on Environmental Biotechnology & Microbiology at National Conference on Environmental Issues and Food Security in India: Let's voice together towards a sustainable future organized by Foundation for Science & Environment, Kolkata, Aug 10th, 2014.
- 2) Delivered a lecture on "Animal Handling" for Educational Multimedia Research Centre (An University Grants Commission Project), St. Xavier's College (Autonomous), Kolkata in 2014.
- 3) Delivered a series of lectures on Developmental Biology and Animal Physiology at Research Career Counselling And Preparatory Camp For Research Eligibility Tests, organized by The Zoological Society, Kolkata at the Dept. of Zoology, University of Calcutta, Oct–Dec 2014.
- 4) Delivered a lecture (as resource person) on "Conservation and Environmental Awareness" in Foundation Course "A Multi Disciplinary View of Education" organized by Department of Education, St. Xavier's College (Autonomous), Kolkata on March 11, 2020.
- 5) Reviewer of international journals.

Posters Presented at Conferences/ Seminars (by Research Scholars/ Summer Trainees)

- 1) A. Majumder, A. Chatterjee, **A. Banerji**. "Effect of ATRA on EGFR mediated MMP regulation in B16F10 murine melanoma cells" at *102nd Indian Science Congress (Section: New Biology)*, organized by The Indian Science Congress Association at Mumbai, Jan 2015.
- 2) A. Agarwal, R. Shrivastav, M. Sarkar, A. Majumder, **A. Banerji**. "Matrix Metalloproteinases (MMPs) and their Roles in Breast Cancer" at *6th International Conference on Stem Cells and Cancer: Proliferation, Differentiation & Apoptosis*, Pune, Oct 2015.
- 3) A. Majumder, A. Chatterjee, **A. Banerji**. "EGFR Mediated Regulation Of MMP-2 Expression And Activity In Human Breast Cancer" at *Current Innovation in Biotechnology for Human Welfare*, organized by Guru Nanak Institute Of Pharmaceutical Science & Technology, Kolkata, Nov 2015.
- 4) A. Majumder, A. Chatterjee, **A. Banerji**. "Regulation of MMP-2 expression by EGFR in human breast cancer cells" at *103rd Indian Science Congress (Section: New Biology)*, organized by The Indian Science Congress Association at Mysuru, Jan 2016.
- 5) A. Majumder, S. Ray, **A. Banerji**. "EGFR mediated regulation of MMP-2 and MMP-9 in human breast cancer" at *36th Annual Conference of Indian Association for Cancer Research*, Thrissur, Feb 2017.
- 6) S. Ghosh, M. Ghosh, A. Majumder, **A. Banerji**. "Effect of All-Trans Retinoic Acid (ATRA) on Integrin $\alpha 5\beta 1$ Mediated Modulation of Matrix Metalloproteinase-2 (MMP-2) in Murine Melanomas" at *Frontiers in Modern Biology 2018*, organized by Indian Institute of Science Education and Research (IISER)-Kolkata, Jan 2018.

7) A. Majumder, **A. Banerji**. “EGFR mediated regulation of MMP-2 and MMP-9 expression and activity in MDA-MB-453 human breast cancer cells” at *An Interdisciplinary Approach to Biological Sciences*, organized by Indian Association for the Cultivation of Science, Kolkata, Feb 2018.

8) A. Majumder, S. Ray, **A. Banerji**. “Targeting epidermal growth factor receptor (EGFR)-EGF interactions in breast cancer” at *INTZOOCON 2018*, organized by Dept. of Zoology, University of Calcutta, Feb 2018.

9) P. Bandyopadhyay, A. Banerjee, S. Sen, A. Majumder, **A. Banerji**. “Focal Adhesion Kinase (FAK): A Possible Therapeutic Target For Breast Cancer” at *Frontiers in Biotechnology, Chapter IV* organized by Dept. of Biotechnology, St. Xavier’s College (Autonomous), Kolkata, Nov 2019. Awarded 2nd prize for poster presentation.

10) S. Sen, A. Biswas, **A. Banerji**. “Analysis of Avian Diversity: An Urban Forest Perspective” at *International Symposium on Environment and Climate Crises* organized by Dept. of Environmental Studies, St. Xavier’s College (Autonomous), Kolkata, *The Blue Patch and The Biome*, Dec 2019.

Seminars/ Conferences Attended

1) International Symposium on Complex Diseases: Approaches to Gene Identification and Therapeutic Management (HGM 2008 Satellite Symposium at Kolkata), organized at Saha Institute of Nuclear Physics, Kolkata, Sept 25th–26th, 2008.

2) National Seminar on Modern Biology in Health and Disease, organized by Dept. of Biophysics, Molecular Biology and Bioinformatics, University of Calcutta, Nov 20th, 2008.

3) National Conference on Future of Food Biotechnology in India, organized by National Institute of Technology, Durgapur, Jan 8th–9th, 2009.

4) National Conference on Environmental Issues and Food Security in India: Let’s voice together towards a sustainable future, organized by Foundation for Science & Environment, Kolkata, Aug 10th, 2014.

5) National Seminar on Current Innovation in Biotechnology for Human Welfare, organized by Guru Nanak Institute of Pharmaceutical Science and Technology, Nov 7th, 2015.

6) National Level Young Scientists’ Meet–2016, organized by The Zoological Society, Kolkata and Dept. Of Zoology, University of Calcutta, Feb 5th– 6th, 2016.

7) Sparsha, an interactive forum for the Educators of today and tomorrow, organized by The Zoological Society, Kolkata and Ramakrishna Mission Vivekananda Centenary College, Rahara, Jan 13th, 2019.

8) International Symposium on Environment and Climate Crises organized by Dept. of Environmental Studies, St. Xavier’s College (Autonomous), Kolkata, *The Blue Patch and The Biome*, Dec 20th 2019.

Workshops Attended

1) Workshop on Advanced Methods In Field Biology And Statistical Application In Life Science Research, organized by The Zoological Society, Kolkata and Dept. of Zoology, University of Calcutta, Oct 10th–21st, 2014.

Orientation/ Refresher/ Short Term Courses Attended

1) Orientation Programme (OP-84), organized at Academic Staff College, University of Calcutta, July 5th–31st, 2010.

2) Refresher Course in Life Sciences, organized at Dept. of Physiology, University of Calcutta, Nov 21st–Dec 12th, 2011.

3) Refresher Course in Life Sciences, organized at Dept. of Physiology, University of Calcutta, Mar 27th–Apr 20th, 2015.

4) Short Term Course on “Workshop on MOOCs & E-Learning: Issues, Prospects, Problems”, organized by UGC Human Resource Development Centre, Jadavpur University, Jan 15th-21st, 2019.

5) Short Term Course on “Language and Linguistics”, organized by UGC Human Resource Development Centre, Jadavpur University, Feb 19th-25th, 2020.

Research Projects

1) Project Title: Anti-cancer potential of ATRA in a murine melanoma model.

Role: Principal Investigator

Granting Agency: University Grants Commission (UGC) Major Research Project

Period of Sanction: 2010–2013.

2) Project Title: Epidermal Growth Factor Receptor (EGFR) A Potential Regulator Of Matrix Metalloproteinases (MMP)

Role: Principal Investigator

Granting Agency: Govt. of West Bengal, Department of Science and Technology

Period of Sanction: 2014-2017.

Research Supervision (for Ph. D)

1) Ms. Aheli Majumder [Registered under Dept. of Zoology, University of Calcutta]

2) Mr. Anirban Roy [Registered under Dept. of Biotechnology, St. Xavier’s College (Autonomous), Kolkata]

3) Ms. Indira Chakraborty [Enrolled under Dept. of Biotechnology, St. Xavier’s College (Autonomous), Kolkata]

Administrative Duties Performed

Head of the Department of Biotechnology, St. Xavier's College (Autonomous), Kolkata from July 2018 – December 2020.

Membership of Scientific Societies

- 1) Indian Science Congress Association (Life Member)
- 2) Zoological Society, Kolkata (Life Member)
- 3) Indian Association for Cancer Research (Life Member)