

FACULTY PROFILE



NAME: **DR. KAUSIKI CHAKRABARTI**
QUALIFICATION: M.Sc, Ph.D(NET & SLET qualified in 2001)
DESIGNATION: ASSISTANT PROFESSOR
PLACE OF WORK: DEPARTMENT OF ZOOLOGY
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AREA OF SPECIALISATION:

Entomology during M.Sc and **Reproductive Cell Biology, Biochemistry and Molecular Biology** during Ph.D and Postdoctoral training.

COMPLETED RESEARCH PROJECT:

Major Research Project entitled “Evaluating the molecular effects of Artemisinin and its derivatives on solid tumors in mice” sanctioned by **UGC** (Sanction Ref. 43-566/2014 of 30.10.2015) Grant approved Rs.10, 49,800. One Project Fellow has been working under the guidance of Dr. kausiki Chakrabarti (PI from Department of Zoology, Charuchandra College) and Dr. Urmi Chatterjee (Co-PI from Department of Zoology, University of Calcutta).

PROFESSIONAL EXPERIENCE (in reverse chronology)

- ❖ Assistant Professor, Department of Zoology, **Charuchandra College** since 16.01.2013
- ❖ Ex Guest Faculty and HOD in the Department of Zoology, **Derozio Memorial College**, Kolkata from 2010-2013.
- ❖ Former Post-doctoral fellow at Reproductive Cell Biology Laboratory, **National Institute of Immunology** (NEW DELHI), (Under Dr. Satish K. Gupta) from 2006-2009.
- ❖ Ex Part-time Lecturer in Zoology, **Lady Brabourne College** and **East Calcutta Girl's College** from 2004-2006.

Teaching experience: 12 years (Taught General Zoology, Biochemistry, Biotechnology, Immunology, Molecular Biology at undergraduate level under University of Calcutta Including theory and Practical)

Research Experience: 12 years

Supervisory Experience: Supervised in project work of two undergraduates, two

Masters students under Calcutta University, one graduate student Under JNU, New Delhi and one B. Tech student.

Member in Professional Committee:

1. Life Member of Zoological Society, University of Calcutta since 2013.
2. Life Member of Indian Science Congress since 2016.
3. Individual Member of ISZS since 2019

Contribution to Management of the Institution:

1. Member of Admission Committee
2. Member of Examination Co-ordination Committee
3. Member of Cultural Committee
4. Member of Student Welfare Committee
5. Member of Campus Development Committee
6. Member of Library committee
7. Member of Sports committee
8. Member of Anti Sexual Harassment Cell

Important Research Projects Handled: (In Reverse Chronology)

Synopsis of UGC-MRP: (Department of Zoology Charuchandra College in collaboration with Department of Zoology, University of Calcutta)

Project title: “Evaluating the molecular effects of Artemisinin and its derivatives on solid tumors in mice”

Significance of the study: To avoid various side effects of chemo and radiotherapy there is strong demand for effective anticancer agent against various cancer cell types with minimal to no side effects. Artemisinin is already approved for use in humans as an antimalarial drug with negligible side effects. Artemisinin and its bioactive derivatives may be prospective anticancer phytochemicals which arrests growth, induces apoptosis and inhibit tumor promotion and progression in various cancer cell lines. This information will allow the rationale design of more effective artemisinin based molecules for the eventual use in anticancer therapies.

Objectives:

- ❖ To develop solid tumor model in mice, using cancer cells and Balb/C mice.

- ❖ To administer and evaluate possible anti-tumor activities of artemisinin in an in vivo mice model.
- ❖ To determine MIC required to reduce the solid tumor and assessment of any possible toxicity caused by the compound.
- ❖ To evaluate molecular mechanisms involved in tumor suppression, such as oxidative stress and apoptosis.

Synopsis of Postdoctoral Project: (NII, New Delhi)

Project I- Recombinant human zona pellucida glycoproteins: Binding characteristics to spermatozoa and subsequent biochemical changes (Funded By ICMR)

Abstract: -Human zona pellucida (ZP) is composed of four glycoproteins designated as ZP1 (amino acid residues 1-638), ZP2 (amino acid residues 1-745), ZP3 (amino acid residues 1-424) and ZP4 (amino acid residues 1-540). A critical evaluation of the functional attributes of the individual human ZP glycoproteins has been hindered due to the paucity of availability of large number of the human oocytes owing to the ethical considerations, and thus, non availability of purified human ZP glycoproteins in sufficient amount from native source. To circumvent this, large scale production and purification of human recombinant ZP were done after expressing in *E. coli* and baculovirus expression system. The quality of the purified recombinant proteins was analyzed by SDS-PAGE and Western blot.

To study the binding characteristics of *E. coli* and baculovirus expressed recombinant human ZP2, ZP3 and ZP4 with capacitated human spermatozoa, direct binding assay was done employing purified recombinant protein labelled with FITC fluorochrome. The acrosomal status of the spermatozoa showing binding to the recombinant protein was simultaneously assessed using PSA-TRITC staining.

The changes pertaining to recombinant human ZP glycoproteins on incubation with capacitated and/or acrosome reacted spermatozoa were determined by resolving the cell pellet as well as supernatant on 0.1% SDS-10% PAGE followed by Western blot. Incubation of the baculovirus expressed recombinant human ZP3 with capacitated spermatozoa resulted in its cleavage into several low molecular weight fragments. The proteolytic degradation was inhibited when recombinant human ZP3 was incubated with capacitated sperm in presence of protease inhibitor cocktail. Failure to detect the presence of recombinant human ZP3 fragment in the cell pellet, within the sensitivity limit of the assay employed, suggests that low molecular weight fragments

can no longer bind to sperm surface and are released into the supernatant. The presence of protease inhibitor cocktail in the reaction mixture resulted in a considerable decrease in the extent of cleavage of recombinant human ZP2 and major portion of it was bound to the sperm. This was in contrast to the results obtained with recombinant human ZP3. Studies in various species have shown that ZP2 acts as the secondary sperm receptor, tethering the acrosome reacted sperm to the ZP matrix and facilitating the penetration of the ZP.

In light of the above observations, it can be postulated that human ZP2 undergoes proteolytic degradation subsequent to induction of acrosomal exocytosis mediated by human ZP3 and spermatozoa remain bound to the oocytes through ZP2 fragments.

Project II: - DNA vaccine encoding chimeric protein encompassing epitopes of human ZP3 and ZP4: Immunogenicity and characterization of antibodies (Funded By ICMR)

Abstract: Immunization with zona pellucida (ZP) glycoproteins lead to curtailment of fertility often associated with ovarian dysfunction. To avoid ovarian dysfunction, synthetic peptides corresponding to ZP glycoproteins have been proposed as candidate immunogens. In the present study, plasmid DNA encoding human ZP glycoprotein-3 (ZP3) epitope corresponding to amino acid (aa) residues 334-343 and human ZP glycoprotein-4 (ZP4) epitope corresponding to aa residues 251-273 separated by a triglycine spacer was constructed using mammalian expression vector, VR1020. The plasmid DNA construct expressed both human ZP3 and ZP4 epitopes as revealed by transient transfection of COS-1 (African green monkey, kidney) mammalian cells. Active immunization of female 50 BALB/cJ mice with DNA vaccine led to generation of antibodies reactive with baculovirus-expressed recombinant human ZP3, ZP4 and ZP3(334 – 343aa) - GGG - ZP4(251 – 273aa) synthetic peptide in an ELISA as well as T-cell responses. Antibodies generated by DNA vaccine also recognized native ZP. The immune sera significantly inhibited ($p < 0.005$) the binding of FITC-labeled ZP3 to capacitated human sperm, whereas no 55 inhibition in the binding of FITC-labeled ZP4 was observed. However, a significant decrease in the acrosomal exocytosis mediated by both recombinant human ZP3 ($p < 0.005$) and ZP4 ($p < 0.005$) was observed in presence of the immune sera. These studies demonstrate that DNA vaccine can be designed to elicit antibodies against small epitopes of ZP glycoproteins.

Summary of Doctoral Thesis: - (Department of Biochemistry, University of Calcutta)

‘Characterization of active principle from Indian medicinal plant and mammalian sperm inactivation’ (Funded By ICMR)

Project initiated to isolate herbal spermicidal agent from edible medicinal plant, partial purification and characterization of *A. sativum* was performed to determine active ingredient responsible for sperm immobilization activity. The main component of the active fraction contained oligosaccharide constituting β -linked glucose molecule of 1152 MW approximately which was determined by NMR, GLC, ESI-MS. The major emphasis was placed on the functional characteristics of the sperm namely viability, HOST, 5'-ND, acrosin, LPO, SOD, LDH, SMAI etc. for clear understanding of the mechanism of action of the plant extract. The important observation was that more than 60% reduction in sperm viability and HOS test in case of treated sperm (MIC of the extract was 50 mg/ml after purification) in comparison to control cells, indicate the probability of disintegration of plasma membrane, which was further supported by SEM study along with the significant reduction of the activity of membrane bound 5'-ND and acrosomal acrosin.

Finally it can be concluded that crude as well as partially purified extract of *A. sativum* exert its effect by destabilizing the sperm plasma membrane architecture, which facilitate to release the key molecules essential for maintenance of sperm motility.

Techniques known: -

- ➡ Basic knowledge on molecular biology including cloning, expression (*E.coli*, Baculovirus), purification of recombinant protein and study of their functional aspects, Transient transfection in COS 1 cell line, indirect immunofluorescence, Insect and mammalian cell culture.
- ➡ Biochemical techniques including purification of protein by gel filtration, ion exchange and affinity chromatography, gel electrophoresis, enzyme assay.
- ➡ Immunological techniques including western blot, ELISA, T-cell proliferation assay.
- ➡ Histologicals procedures (preparation of mammalian tissue {fixation, paraffin embedding}, microtomy and staining) Process of in vivo trial of herbal extract on mice through oral administration and in vitro trial of purified fraction of plant extract on human ejaculated sperm and studies of different sperm functional parameters,

- Fundamental knowledge of IVF/ICSI and micromanipulation procedures
- Experience in the use of Microsoft Office related programs.

List of Selective publications

- **Chakrabarti K;** A brief report on avifaunal diversities in Purbasthali (Chupir Char) and their ecological interpretation; *Environment and Ecology*; (2021); Volume 39 (1): 82-91. **ISSN: 0970-0420.**
- **Roy T & Chakrabarti K;** A brief report on marine faunal diversity of Vishakhapattanam-representing the east coast of India; *International Journal of Current Research in Life Sciences*; (2020); Volume 09, No.10: 3342-3348. **ISSN: 2319-9490.**
- **Chakrabarti K;** Artemisinin- A source of potential anticancer agent, Book Chapter published in *Frontier Aspects of Natural Sciences*; (2020); 76-79. **ISBN-978-81-86359-83-4.**
- Gupta N, **Chakrabarti K**, Prakash K, Wadhwa N, Gupta T, Gupta SK.; Immunogenicity and contraceptive efficacy of *Escherichia coli*- expressed recombinant zona pellucida proteins; *American Journal of Reproductive Immunology*; (2013); Volume 70: 139-152. **ISSN No.: 1600-0897; Impact Factor: 2.668.**
- Pattanayak P, Pratihar J L, Patra D, Lin CH, Paul S, **Chakrabarti K;** Synthesis, characterization, structure, redox property, antibacterial and catalytic activity of tridentate Schiff base cobalt (III), nickel (II) and palladium (II) complexes; *Polyhedron*; (2013); Volume 51: 275-282. **ISSN No.: 0277-5387; Impact Factor: 2.047.**
- Gupta SK, Bansal P, Ganguly A, Bhandari B, **Chakrabarti K.**; Human zona pellucida glycoproteins: functional relevance during fertilization; *Journal of Reproductive Immunology*; (2009); Volume 83, Issue 1, 50-55. **ISSN No: 0165-0378; Impact Factor: 2.632.**
- Choudhury S, Kakkar V, Suman P, **Chakrabarti K**, Vrati S and Gupta SK.; Immunogenicity of zona pellucid glycoprotein 3 and spermatozoa YLP12 peptides

presented on Johnson grass mosaic virus-like particles; *Vaccine*; (2009); Volume27, Issue 22: 2948-2953. **ISSN No: 0264-410X; Impact Factor: 3.383.**

- Bansal P, **Chakrabarti K**, Gupta SK.; Functional activity of human ZP3 primary sperm receptor, resides towards its Cterminus; *Biol Reprod.* (2009) Jul; Volume 81(1):7-15. **ISSN No: 0006-3363; Impact Factor: 3.945.**
- Choudhury S, Ganguly A, **Chakrabarti K**, Sharma R K, Gupta S K; DNA vaccine encoding Chimeric protein encompassing epitopes of human ZP3 and ZP4: Immunogenicity and characterization of antibodies; *Journal of Reproductive Immunology*; (2008)Volume 79, Issue 2, Pages 137-147. **ISSN No: 0165-0378; Impact Factor: 2.632.**
- **Chakrabarti K.**, Pal S., Bhattacharyya A. K.; Sperm immobilization activity of *Allium sativum* L. and other plant extracts. *Asian J Androl.* (2003); Volume 2: 131-135. **ISSN NO. 1008-682X; Impact Factor 2.644.**
- Sarkar M., Gangopadhyay P., Basak B., **Chakrabarti K.**, Banerji J., Adhikary P., Chatterjee A.; The reversible antifertility effect of *Piper betle* Linn. on Swiss Albino male mice. *Contraception.* (2000); Volume 62: 271-274. **ISSN No. 0010-7824; Impact Factor: 2.335**
- Sengupta A., Adhikary P., Basak B. K., **Chakrabarti K.**, Gangopadhyay P., Banerji J.& Chatterjee A.; Pre-clinical toxicity evaluation of leaf-stalk extractive of *Piper betle* Linn. in rodents. *Indian J Exp Biol.* (2000); Volume 38: 338-342. **ISSN NO. 0975-1009; Impact Factor 1.165.**

➤ **BOOKS PUBLISHED AS SINGLE AUTHOR:**

Sl. No.	Title with Page No.	Type of book & authorship	Publisher, ISSN/ISBN No.	Whether peer reviewed, Impact Factor if	No. of Co-authors	Whether you are the main author

				any		
1.	INDIAN MEDICINAL PLANT AND MAMMALIAN SPERM INACTIVATION	Ph. D Dissertation Single author	LAP LAMBERT ACADEMIC PUBLISHING, ISBN: 978-3-659- 82557-6	NA	NA	Main author

OTHER ACHIEVEMENTS: -

- ❖ Served as **joint organizing secretaries in the UGC sponsored State Level Seminar** on 'Recent Trends in Chemistry and Biology: to ignite young minds' Organised by the Department of chemistry, Botany and Zoology, Derozio Memorial College in collaboration with Department of Zoology, West Bengal State University, Feb 18, 2012.
- ❖ Contributed as a **Peer Reviewer** for the year 2010 and achieved certificate of appreciation provided by '**The Malaysian Journal of Medical Sciences**'.
- ❖ Attended workshop in August **2006**, as **faculty** on Micromanipulation of Gametes and vitrification and comprehensive workshop on Andrology organized by Andrology and Reproductive Health Research Programme, Ashok Laboratory, Kolkata; Bengal Urological Society, Kolkata in association with University of Calcutta; Institute of Reproductive Medicine, Kolkatas; IVF and Infertility Research Centre, Calcutta; IICB, Calcutta and IIT Kharagpur, WB.
- ❖ **Best poster award winner** in an International Congress held in February 22-25, 2006 at NII, New Delhi, India.
- ❖ Appointed as **Evaluator of National Children Science Congress** 2003 and 2004.

PARTICIPATION IN TRAINING COURSES:

Sl. No.	Programme	Duration	Organized by
1.	Participated and successfully completed UGC sponsored Refresher Course in Zoology	18.03.2019 to 07.04.2019	H.R.D.C. (UGC-Academic Staff College) NEHU, SHILLONG.
2.	One Week Faculty Development Program on Environment Sustainability and Higher Education	04.06.2018 to 11.06.2018	IQAC, Dyal Singh College in collaboration with University of Delhi
3.	Participated and successfully completed UGC sponsored Refresher Course in Life Sciences	13-11-2015 to 03-12-2015.	H.R.D.C. (UGC-Academic Staff College) University of Hyderabad
4.	Participated and successfully completed UGC sponsored Orientation Course	25.08.2014 to 19.09.2014.	UGC-Academic Staff College, Jawaharlal Nehru University