



# Department of Biochemistry

## University of Delhi, South Campus, New Delhi-110021

The Department of Biochemistry is a premiere biochemistry department in the country, established in 1983. Students are offered PG level (M.Sc. and Ph.D.) courses in Biochemistry with advanced level theory and practical learning in various classical and modern areas of biochemistry with utmost emphasis on hands-on-training. The teaching and research theme of the department is: **Development of molecular strategies to combat various human diseases.** The department contributes to social needs majorly through its research activities by discovering rationalised novel drugs, developing diagnostic kits and vaccines for the community.

### FACULTIES & STAFF



### PATENTS

"Novel anti-malarial liposomal formulation", **Prahlad Chandra Ghosh, Alo Nag**, Mohsin Raza, Aakriti Singal and Hina Bharti, Indian patent granted in July 2021 (ID 201711016131)

"Mutants of Mycobacteria and process thereof", **Anil K. Tyagi**, Ramandeep Singh, Vivek Rao, Vadakkupattu Devasenapathi Ramanathan, Chinnambudu Nainarappan Paramasivan, Paranjit Ramayengar Narayanan, Yogendra Singh, Patent No. 259594, Indian patent Application No. 882/DEL/2003 (Patent granted on 19th March 2014).

"A process of producing of-enriched phage display library and uses thereof", **Amita Gupta, Vijay K. Chaudhary** and Nimisha Shrivastava, Indian Patent 2346/DEL/2013 dated 06.08.2013.

"Improved process for expression, purification and enhanced recovery of Mycobacterial recombinant proteins", **Vijay K. Chaudhary and Amita Gupta**, 263766, 2014

"Process for producing modified reconstituted Sendai viral envelope specific for drug and/or gene delivery to liver cells", **Sarkar, Debi P.** Verma Santosh K., Krishnan Anuja, Sharma N.R., PCT No. PCT/IN2006/000061, International, 2010.

"Lambda phage display system and the process", **Vijay K. Chaudhary, Amita Gupta**, Sankar Adhya, Ira H. Pastan, US 7,410,801, August 12, 2008.

"A simple and fast process for evaluating *Mycobacterium tuberculosis* promoters and the effect of candidate antimycobacterial compounds on promoter activity and bacterial viability under hypoxic and aerobic conditions using *M. smegmatis* as a surrogate host", **Jaya Sivaswami Tyagi, Gargi Bagchi, Mayuri, Neetu Kumra, Kohinoor Kaur, Deepak Kumar Saini, Anil Kumar Tyagi**, Patent No.211217, National, Application No. 981/DEL/2003

"A process for the isolation and purification of protein p17 of HIV-1 subtype C". **Vijay K. Chaudhary**. (No.808/Del/2003).

"A process for the isolation and purification of protein p24 of HIV-1 subtype C". **Vijay K. Chaudhary** (No. 1478/Del/99).

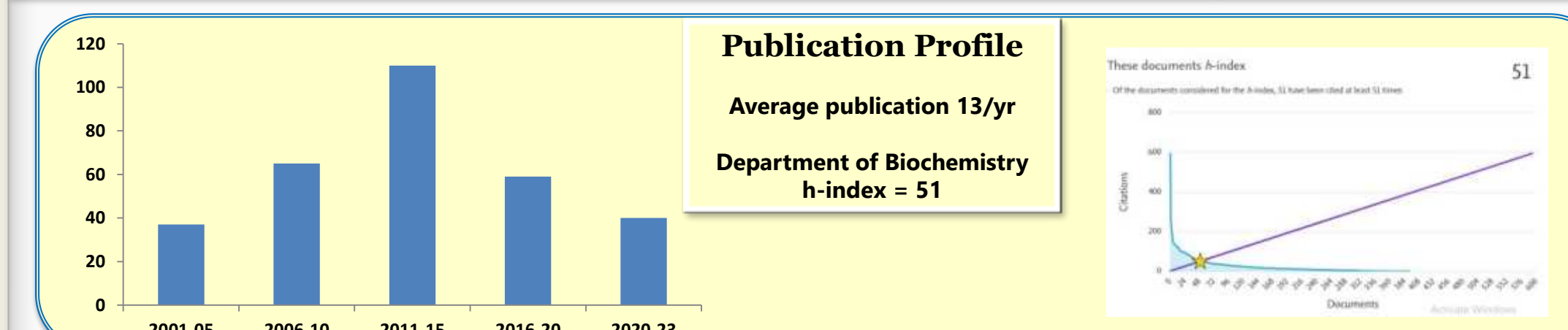
"Process for Producing A Targeted Gene", **Sarkar, Debi P.** Ramani, Komal, Bora, Roop S., Kumar, Mukesh, and Tyagi, Sandeep K., 5,683,866, International, 1997.

"Monoclonal Antibodies (MAbs) against two coat proteins gIIp and gVIlp of filamentous phage M13 and a process for their preparation". **Vijay K. Chaudhary**. Patent No.764/Del/94, dated 20th October 1997.

### TECHNOLOGY TRANSFER

- (1) **Liposomal Amphotericin B** - commercialized by Life Care Innovations, Gurgaon.
- (2) **Monoclonal antibodies to M13 phage protein** - commercialized by M/s Pharmacia (now GE Healthcare), 1998 (\$20,000 received for technology transfer).
- (3) **Rapid test for HIV (AIDS)** - commercialized by M/s Cadilla Pharmaceuticals Limited, Ahmedabad, 1998-2001 (Rs.30 lacs received for technology transfer)
- (4) **Detection of *M. tuberculosis* in culture** - transferred to M/s SPAN Diagnostics Limited, Surat (2011-17; now Arkay Health Care Pvt. Ltd.) and is likely to be available in the market shortly as the product has received approval from Drug Controller General of India (Rs.20 lacs received for technology transfer).
- (5) **Virosome Technology for targeted delivery** – transferred to Pancea Biotech. India, New Delhi, 2004 (Rs.17.5 lacs received for technology transfer).
- (6) **Three of the vaccine regimens against Tuberculosis** in principal have been approved for clinical trials by Tuberculosis vaccine clinical trials expert group of the Department of Biotechnology Govt. of India.

### Research Output


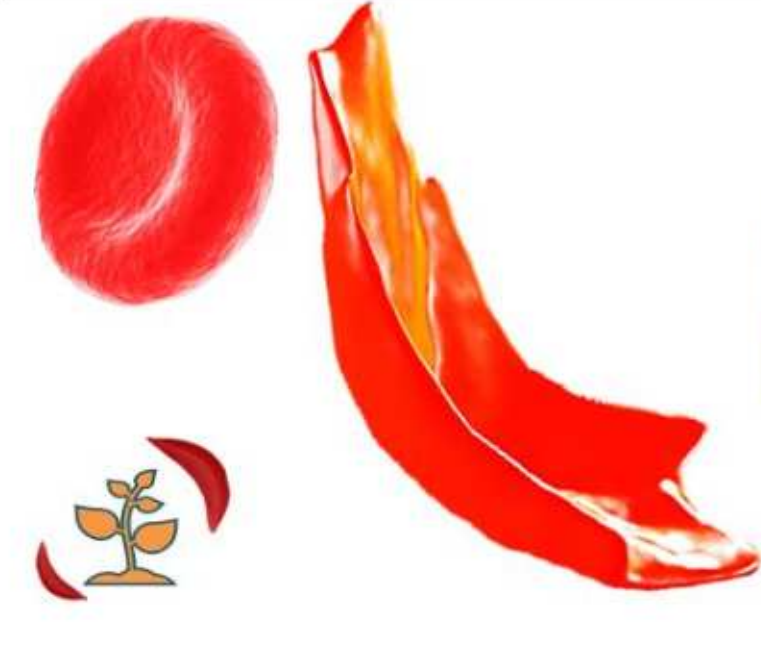


The department has also taken lead in whole genome sequencing of indigenous pathogens like *Mycobacterium indicus pranii*, which opened up new horizon in understanding the evolution of pathogenesis in mycobacterial species and leprosy. It represented the first completed genome of a new species of bacteria published from India.

Faculty members are working in close collaboration with industry or other institutions to take the leads to the next level of translation.


### Major projects and Research Collaborations with Academia & Industry

**Sailin-HbS, a novel, botanical, oral formulation to alleviate pain in Sickle Cell Disease: a potent anti-sickling agent**




**Prof Suman Kundu – Mission to Eliminate Suffering due to SCD**

HbS-Sailin® is a unique formulation carved out of extracts of: the seeds of *Piper guineense*, the stems of *Pterocarpus osun*, the fruit of *Eugenia caryophyllum*, the leaves of *Sorghum bicolor* and *Curcuma longa*

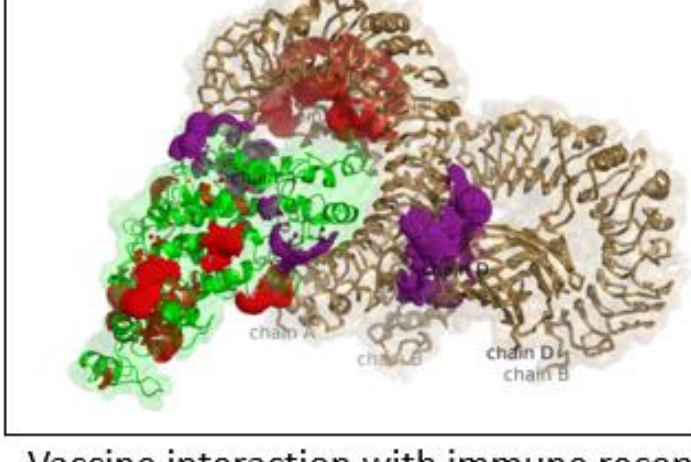
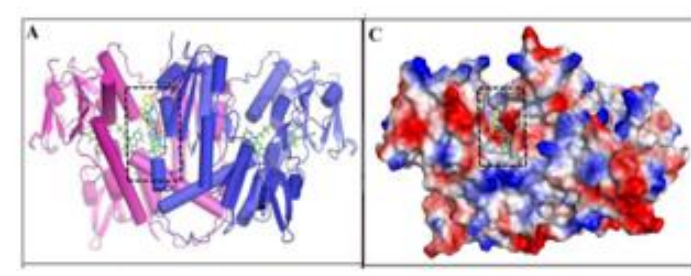


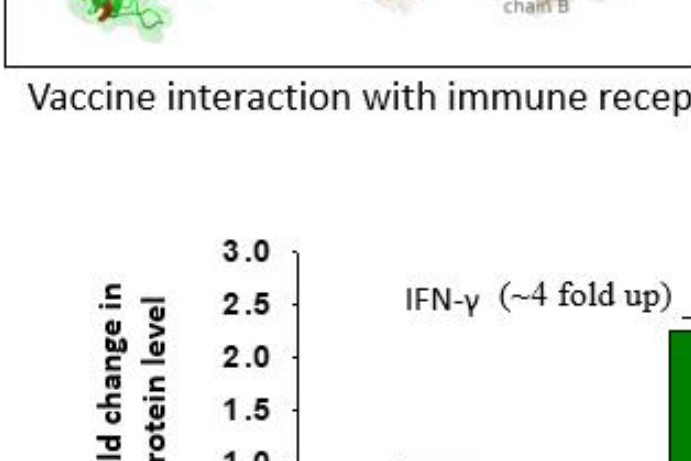
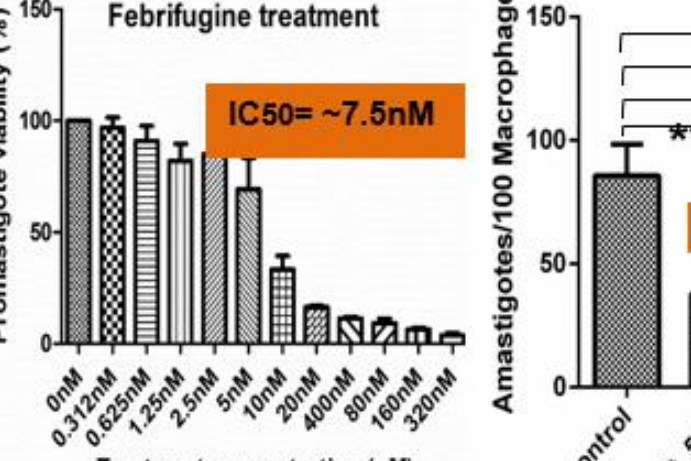
**The Team and Collaborators**

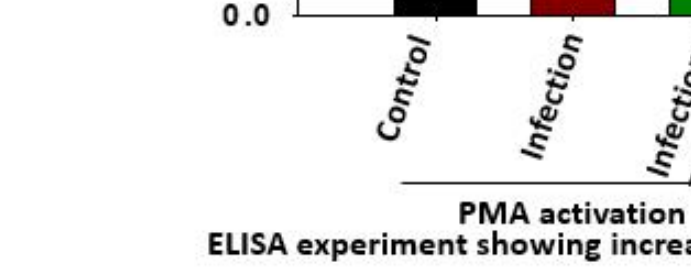
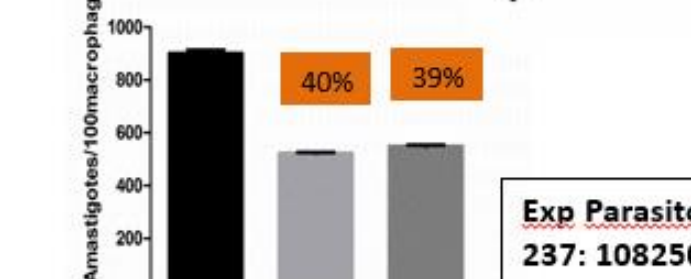


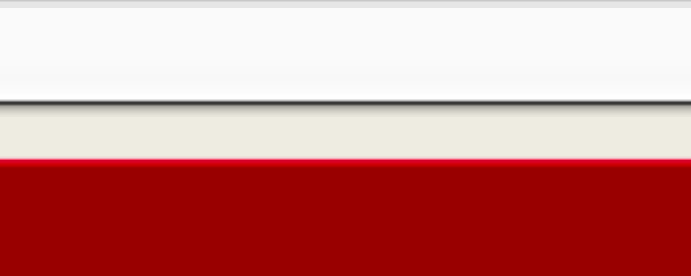
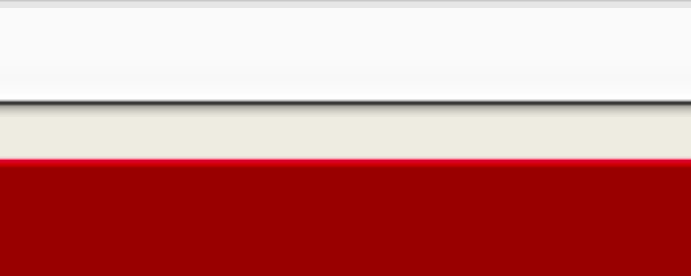
**Leishmaniasis Research**

**Drug discovery Dr. Vijay Kumar Prajapati Vaccine Development**




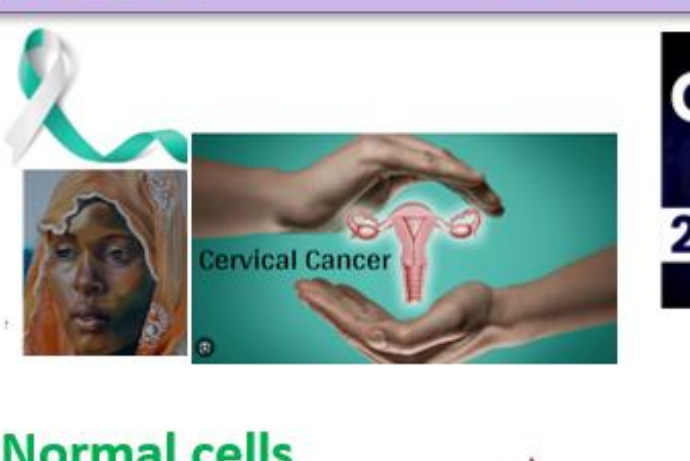


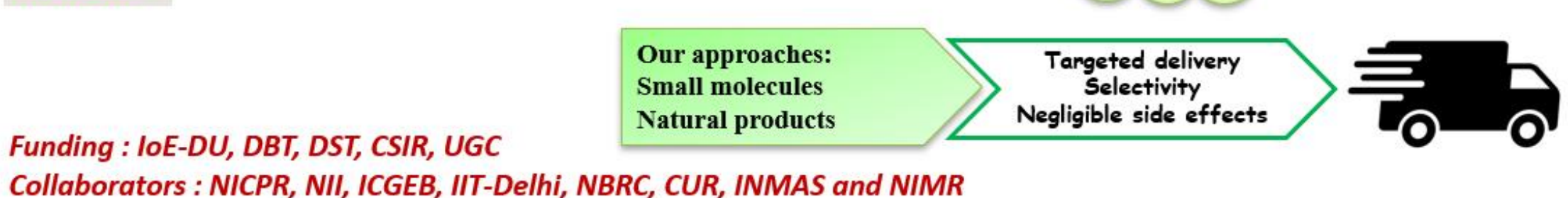





**Prof. Alo Nag**


**Understanding the molecular mechanisms of oncogenesis Identification of novel drug targets Mechanism based Drug design against Cancer and Malaria**




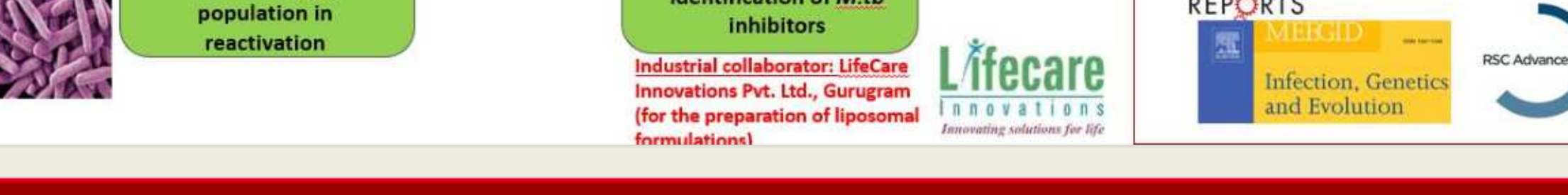



Funding : IoE-DU, DBT, DST, CSIR, UGC  
Collaborators : NICPR, IIL, ICGEB, IIT-Delhi, NBRC, CUR, INMAS and NIMR

















**Prof. Amita Gupta**

**Developing Strategies to curtail the spread of tuberculosis**

S.No.	Title of Project	Funding Agency	Amount	Name of PI	Collaborators	Duration of the project
1	Understanding the Role of Ser/Thr Protein Kinases in the regulation of Toxin-Antitoxin Loci in Mycobacterium tuberculosis	DBT	1.23 crores	Prof. Amita Gupta (UDSC)	Dr. Vandana Malhotra (Sri Venkateswara College, DU)	2021-2024
2	Understanding the role of Rv1955-Rv1956 Toxin-antitoxin (TA) locus of M. tuberculosis in pathogen biology-	DBT	52.8 lacs	Prof. Amita Gupta (UDSC)	Dr. Ramandeep Singh (THSTI)	2016-2019

**Publications:**


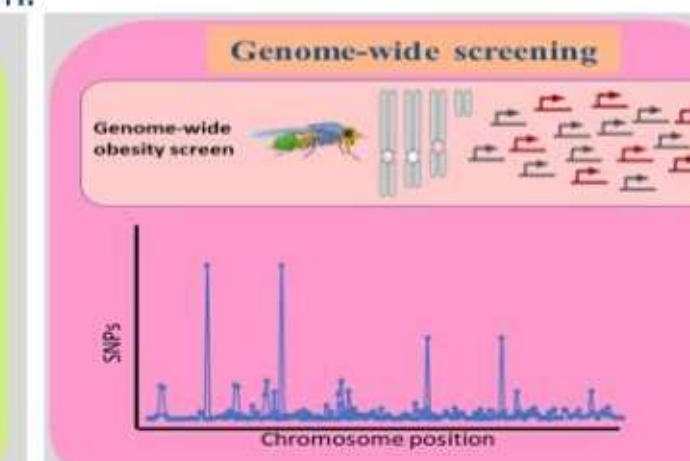
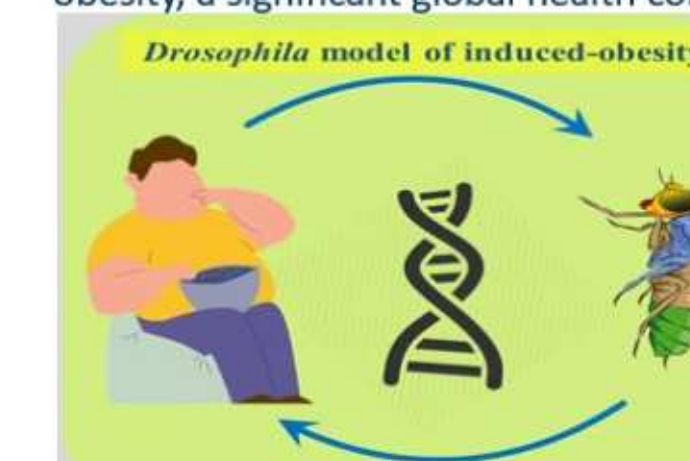
1. Arun Sharma, Kalpana Sagar, Neeraj Chauhan, Balaji Venkataraman, Nidhi Gupta, Tannu Priya Gosain, Nikhil Bhalla, Ramandeep Singh and **Gupta, A.** (2021) HigB1 Toxin in Mycobacterium tuberculosis is upregulated during stress and required to establish infection in Guinea pigs. *Frontiers in Microbiology* (doi: 10.3389/fmicb.2021.748890).

2. **Gupta, A.**, Venkataraman, B., Vasudevan, M., & Gopinath Bankar, K. (2017). Co-expression network analysis of toxin-antitoxin loci in Mycobacterium tuberculosis reveals key modulators of cellular stress. *Sci Rep*, 7(1), 5868. ISSN - 2045-2322

**Toxin-antitoxin loci are implicated in the successful survival of Mycobacterium tuberculosis in stress conditions, drug tolerance and drug resistance. These publications describe the expression and regulation of the TA loci during multiple stress conditions emphasizing their essentiality for survival of TB-causing bacteria. This work will enable new drug targets to be identified for TB treatment.**

**Dr. Dau Dayal**

**Drosophila research lab:** The primary research focus is to develop *Drosophila* as a proxy model for studying human obesity and other lifestyle disorders, and examining genome-wide high-confidence genetic markers linked to these conditions. The lab's findings have provided insights into novel markers and pathways associated with diet-induced obesity, a significant global health concern.




**Developing Drosophila as a proxy model for human obesity**

**High resolution screening of genetic markers associated with obesity**

**International collaborations**

**Key Publications in Journals**



### Outreach Initiatives

MAY MEASUREMENT MONTH was observed (May 2017) to spread awareness about the significance of Blood Pressure and our health.



Department organises and participates in various outreach and community services to motivate young minds of school and college students for pursuing higher education, spread awareness about significance of Science and Research in our daily life

#### Mentoring school students



**UDSC-BSL3/ABSL3- A National Facility for Tuberculosis Research**

BSL-3 is located in the animal house at UDSC and has a total area of 1517 sq. ft. that includes a research lab (610 sq. ft) well equipped to carry out microbiological investigations and animal holding room (ABSL-3) (445 sq. ft.) for holding experimentally infected guinea pigs (n=360) and mice (n=640) along with change rooms, media preparation room and wash room.

**Outreach and Skill development activities:** Organized and conducted 08 training programs/workshops (07 online and 01 hands-on) for BSL3 practices, BSL3 guidelines, handling of pathogenic organisms, TB research protocols and drug discovery - **812 participants, 70-80 different institutions, 07 workshops conducted, March 2021-April 2023.**

1. 22<sup>nd</sup> - 28<sup>th</sup> March 2021 - "Working in BSL3 laboratory and Practices for Handling *Mycobacterium tuberculosis*". 94 participants (from 24 different institutions) were registered and participated in this online programme.
2. 19<sup>th</sup> - 25<sup>th</sup> July, 2021 - "BSL-3 LABORATORY TRAINING AND HANDLING PRACTICES FOR *Mycobacterium tuberculosis*". 186 participants (from 52 different institutions) were registered and participated in this online programme.
3. 26<sup>th</sup> October- 1<sup>st</sup> November, 2021 - "Advanced training course on TB research in BSL3 and protocols". 133 participants (from 67 different institutions) were registered and participated in this online programme.
4. 27<sup>th</sup> January - 2<sup>nd</sup> February, 2022. - "BSL-III laboratory Working Practices and *Mycobacterium tuberculosis* handling protocols". 149 participants from 55 different Institutes/ Universities/Colleges all over the country
5. 24<sup>th</sup> - 27<sup>th</sup> May, 2022. - "Drug Discovery (with a focus on TB drug discovery)". 85 participants from 45 different Institutes/ Universities/Colleges all over the country
6. 20<sup>th</sup> - 26<sup>th</sup> Sep, 2022. - "Training course on BSL3 practices and advanced TB research practices". 94 participants from 61 different Institutes/ Universities/Colleges all over the country
7. 7<sup>th</sup> - 10<sup>th</sup> December, 2022. - "Hands-on Training course on BSL3 practices and TB research protocols". 14 participants from 08 different Institutes/ Universities/Colleges all over the country
8. 28<sup>th</sup> March - 1<sup>st</sup> April, 2023. - BSL3 practices, genetic manipulation and drug discovery protocols for TB research. 57 participants from 39 different Institutes/ Universities/Colleges all over the country