



JAS-ANZ



An ISO 9001: 2008

Certified Organisation

Haffkine Institute

For Training Research and Testing

An Autonomous Institute of Govt. of Maharashtra Registered under Societies Registration Act 1860

Recognised as "Scientific & Industrial Research Organisation" (SIRO) by Govt. of India, Ministry of Science & Technology.



ANNUAL REPORT

2013-14



ISO 9001:2008 Certified



ANNUAL REPORT **2013 - 2014**

OF THE

HAFFKINE INSTITUTE
FOR TRAINING, RESEARCH & TESTING

ACHARYA DONDE MARG, PAREL
MUMBAI 400 012



HAFFKINE INSTITUTE FOR TRAINING, RESEARCH AND TESTING

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Director, Haffkine Institute for Training, Research & Testing,
Parel, Mumbai-12

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| 9. Shri S. P. Gajbhiye
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Parel, Mumbai-400012 | Convener |

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Former Director of Medical, Education & Research, Govt. of Maharashtra
Visiting Scientist & Adjunct Professor, Haffkine Institute.
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8. **Dr. H.S. Palep** **Member**
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9. **Dr. Abhay S. Chowdhary** **Member**
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10. **Dr. S.P. Vaidya** **Convener**
Asst. Director, Department of Clinical Pathology
Haffkine Institute for Training, Research & Testing,
Parel, Mumbai- 400 012.

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| 1. Dr. Abhay S. Chowdhary
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Asst. Director, Department of Clinical Pathology
Haffkine Institute for Training, Research & Testing,
Parel, Mumbai-12 | Member |
| 3. Shri S.P. Gajbhiye
Senior Scientific Officer,
Department of Bacteriology,
Haffkine Institute for Training, Research & Testing,
Parel, Mumbai-12 | Member |
| 4. Dr. S.T. Kothari
Senior Scientific Officer,
Department of Virology,
Haffkine Institute for Training, Research & Testing,
Parel, Mumbai-12 | Member |
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(Workers' Union Representative) | Member |
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Haffkine Institute for Training, Research & Testing,
Parel, Mumbai-12 | Member Secretary |

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Scientist E (Deputy Director),
National Institute for Research in Reproductive Health, Parel. | Member |
| 7. Dr. Aditee Vaidya,
M.F.A. Ph.D. | Member |
| 8. Dr. Shashikant Vaidya,
Ph.D.(Microbiology), DPH, MHRDH,
Asst. Director, Clinical Pathology Department, HITRT, Parel | Member Secretary |

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| 1. Dr. (Mrs.) M. A. Phadke,
M.D.(Paediatrics), DCH, FIAP, MRCP (UK), FRCPH, MNAMS,
Consultant, UNICEF, Member WHO (Vaccine Safety
Committee) | Chairperson |
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M.D. (Medical Microbiology), DMV, DHA,
Director, HITRT, Parel. | Member |
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M.D.(Pathology), Ph.D. (Microbiology)
Adjuvant Professor & Visiting scientist, HITRT, Parel. | Member |
| 4. Dr. A. H. Bandivadekar,
Ph.D.(Biochemistry)
Scientist E (Deputy Director),
National Institute for Research in Reproductive Health, Parel. | Member |
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Ph.D.(Pharmacology & Toxicology)
Prof of Pharmacology and Toxicology, Bombay Veterinary
College | Member |
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M.V.Sc.(Pathology)
Deputy Manager (Veterinary), Haffkine Bio-pharmaceutical
Corporation Limited, Parel | Member |
| 7. Dr. Aditee Vaidya,
M.F.A. Ph.D. | Member |
| 8. Dr. Shashikant Vaidya,
Ph.D.(Microbiology), DPH, MHRDH,
Asst. Director, Clinical Pathology Department, HITRT, Parel | Member Secretary |

RECOGNITIONS OF HAFFKINE INSTITUTE.

1. Haffkine Institute is an ISO 9001: 2008 certified organization
2. Recognized by Govt. of India as a “Scientific and Industrial Research Organization (SIRO)” and “R & D Centre” (DST)
3. WHO, ICMR and IDSP National Influenza Surveillance Centre for Human and Avian Influenza
4. Govt. of India and State Government authorized Laboratory for Molecular Diagnosis of pandemic H1N1 (Swine Flu)
5. WHO Reference Centre for Rabies
6. NCDC Plague surveillance centre
7. State Excise Department For Testing of IMFL, Country liquor, Adulterants etc.
8. Food & Drug Administration (FDA) for Testing of Drugs.
9. Charitable Trust and Public Funded Research Laboratory

QUALITY POLICY OF HAFFKINE INSTITUTE



Haffkine Institute
for Training, Research & Testing

An ISO 9001:2008 Certified, Autonomous Institute of Government of Maharashtra

Quality Policy

We are committed towards serving the welfare of humans and animals through the investigative discovery of the means of ameliorating and alleviating suffering and providing holistic measures for research, diagnosis, prevention, treatment and education in the bio-medical and allied fields of science.

We aim:

- To be a continually improving and learning scientific institution by providing education, training, conducting research concerning vital problems in various medical and related scientific fields and by being a pioneer in the field of clinical diagnosis and testing of diverse substances.
- To be a socially responsible institute that provides advice, collaboration and assistance to the Government and appropriate authorities and other organizations in all matters concerning the welfare of public health.

November, 1st, 2010

Director

STAFF OF THE HAFFKINE INSTITUTE

ADMINISTRATION

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Dr. Abhay Chowdhary, M.D, DHA, DM Virology, FIMSA.

Chief Administrative Officer

Shri. D. B. Malekar, B.Com.

Accounts Officer

Smt. N. U. Gandhi, B.Com.

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Senior Scientific Officer

Shri. S.P. Gajbhiye, M.Sc. {Assistant Director (Addl. Charge)}

Scientific Officer

Smt. Amita S. Patil, B.Sc.

Smt. Jayashree A. More, B.Sc.

BIOCHEMISTRY

Assistant Director

Dr. A. Rosalinda Marita, Ph.D.

Senior Scientific Officer

Smt. P. V. Ansulkar, M.Sc.

Scientific Officer

Ms. Amruta A. Naik, M.Sc.

CLINICAL PATHOLOGY

Assistant Director

Dr. S.P. Vaidya, M.Sc., Dip Public Health, M.H.R.D.M, Ph.D,

Senior Scientific Officer

Dr. Sheetal U. Vasave, M.B.B.S, P. G. Dip in health Science in Diabetology, MPH, AFIH.

Medical Officer

Dr. S.N.Pashte, M.B.B.S, D.H.H.M

Dr. S.U. Mane, M.B.B.S.

Scientific Officer

Smt. Vibhuti A. Thakur, B.Sc.

CHEMOTHERAPY

Assistant Director

Dr. A. S. Bobade, M.Sc. Ph.D.

Scientific Officer

Ms. Vrushali N. Patil, M.Sc

Shri. Sushant Kaple, M.Sc.

CHEMICAL TESTING DEPARTMENT

Assistant Director

Dr. A.S. Bobade, M.Sc. Ph.D.

Senior Scientific Officer

Smt. Suvarna N. Pachpore, M.Sc.

Scientific Officer

Smt. S. L. Patil, B.Sc.

Shri. Ashish L. Asrondkar, M.Sc.

Shri. Manoj K. Patil, M.Sc.

Shri. Santosh B. Bagal, B.Sc.

TOXICOLOGY

Scientific Officer

Dr. Mrunal S. Sawant, M.V.Sc. (Office Incharge)

Smt. Swati U. Mumbarkar, B.Sc.

ZOONOSIS

Senior Scientific Officer

Dr. Mira L. Ramaiya, M.Sc, Ph.D. {Assistant Director (Addl. Charge)}

Scientific Officer

Dr. Mrunal S.Sawant, M.V.Sc. (Snake Farm and Animal house facility)

Smt. Trupti A. Satvekar, B.Sc.

Dr. (Smt.) S. Bapna M.Sc., Ph.D (Research Associate)

VIROLOGY

Head, Department of Virology

Dr. Abhay S. Chowdhary, M.D, DHA, DM Virology, FIMSA.

Senior Scientific Officer

Dr. (Ms). Sweta. T. Kothari, M.Sc. Ph.D. M.B.A.

Scientific Officer

Shri. Ritwik Dahake, M.Sc.

Shri. Sandeepan R. Mukherjee, M.Sc.

Shri. Pawankumar T. Todkar, M.Pharm

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Officer In-charge

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Training Officer

Shri. Sandeepan Mukherjee, M.Sc.

LIBRARY

Librarian

Shri. Sandeepan Mukherjee, M.Sc. (Addl. Charge)

HIGHLIGHTS OF ACHIEVEMENTS

1. “Haffkine Day” on 10th January and “Haffkine Foundation Day” on 10th August were commemorated by the Institute. Over 250 delegates from various branches of medical and para-medical fields participated in scientific programs conducted during these events.
2. The 478th meeting of “Teaching Pathologists & Microbiologists conference meeting” was organised by the Institute on 18th January, 2014 and it was attended by the pathologists of the different hospitals, staff and students of the Haffkine Institute.
3. Women’s Day was celebrated by the all women staffs of Haffkine Institute on 8th March 2014.
4. Currently the Institute has 20 Senior Research Fellows and 9 Junior Research Fellows, out of it one enrolled for M.Sc. in the current academic year.
5. Institutional Ethics Committee (IEC) and Institutional Animal Ethics Committee (IAEC), Haffkine Institute evaluated Twenty Five (31) research projects in the current year.
6. International conference on Stem Cells and Cancer (ICSCC-2014) was organised by Haffkine Institute in collaboration with International Center for Cancer, stem cells and Biotechnology (CSCCB), Pune from 19th to 22nd October 2014.
7. Haffkine Institute is selected as a nodal institute for training under State Training Policy by MEDD. Institute has trained 73 participants in this year, mainly doctors from Ayurved, Directorate of Medical Education and Research, Haffkine Institute and Maharashtra University of Health Science under foundation training program, in which training for administrative work is given.
8. The Science Academies’ Refresher course on “Updates on Infectious Diseases” was organised by Haffkine Institute, from 22nd September to 5th October 2013.
9. Four departments: Clinical Pathology, Bacteriology, Biochemistry and Chemical testing, renovated as per Good Laboratory Practice (GLP) norms
10. The Haffkine Institute Museum was inaugurated on 5th March 2014. Dr. Vijay Kumar Gavit, former Minister for medical Education and Drugs did the honours.
11. Dr. Pratibha Chartuvedi and Dr. Abhay Chowdhary were awarded the IDMA best paper prize.
12. A separate ‘Proteomics Laboratory’ established for carrying out research in proteomics and protein chemistry.
13. The Haffkine Institute Library has been modernized and digitized as per international standards.

INTRODUCTION

The year 2013-14 was significant for Haffkine Institute. Institute organised a conference encompassing research in Ayurveda and its implications in Modern Medicine: "TADVIDYA SAMBHASHA" on 16th September 2012 in collaboration with Dr. Palep's Research Centre. Dr. D. Y. Patil, His Excellency the Governor of Tripura was the Chief Guest for the event. Institute has also organised Meeting on "Ayurveda and Reverse Pharmacology- Emerging Discipline for Drug Discovery" on 5th February 2013. The TRANSPIRE group was formed consisting of researchers from various fields of Ayurveda, Modern Medicine, Pathology, Immunology, Parasitology and Phytochemistry. Both were attended by the scientists of national and international repute.

Institute has also organised two day symposium on the occasion of "Maharashtra Biotechnology Day" on 15th & 16th December, 2012 on behalf of Department of Industries, Government of Maharashtra which was attended by the students from various colleges in Biotechnology field.

This year too many competent scientists with expertise in biotechnology and stem cell research joined the institute. This recruitment has provided momentum to the research, training & testing activities of the Institute. The expertise and initiative of these scientists will develop the scope of the laboratory services and research in institute in near future.

Highlights of the various activities of the Institute:

Zoonosis

Department of Zoonosis is actively engaged in research, testing and training activities, emphasising on vector and vector borne diseases of zoonotic importance since many years. The department is following the convention of the Institute, to be active in research in Public health and Infectious diseases. Research activities in the department are directed in various domains like vaccine development and therapeutics of diseases like Malaria, Japanese Encephalitis and Toxoplasma. The Department is actively engaged in Bio efficacy, persistency, repellence, testing against Crawling & flying insects, mosquito repellence test on human skin, Water resistance study and testing of Anti- Ant and Anti Wasp activity of different compounds as per WHO guidelines.

Department actively participates in training programmes like Annual Biotechnology Training and Viro-vitals. The department conducts training programme "Mission to Control Mosquito Menace" for under graduate and post graduate students.

The Department is affiliated to the University of Mumbai & MUHS Nasik, for M.Sc. and Ph.D. degrees. Currently the department has six Ph.D. students, two M.Sc. students and ten Short term research internship programme students. Ongoing activities of department are supported by novel training and testing methodologies which are carried out with zeal & devotion.

Venomous Animal Unit

Venomous animal Unit is actively engaged in research and testing of natural compounds to explore the repellent property against snakes. The department conducts various training programmes on various aspects of snakes and its importance for those who are working with

public health authorities, paramedical and medical institutes, colleges and schools at state and national levels.

Recently department had validated the Anti rodent and Anti termite testing procedure for evaluating the efficacy of repellents coated in pipes, cables etc. Department is also engaged in research on herbal anti snake venom and anti scorpion compounds which will facilitate in reducing the snake and scorpion bite fatality incidences. Department also undertakes scientific training on identification of venomous and non venomous snakes, how to apply first aid measures post snake bite and how snakes are important to maintain the ecological balance.

Snake survey is one of the major activity of the department where in department provides scientific guidance to various institutes, universities, five star, three star hotels etc for controlling the snake menace in their premises. Apart from this department is also involved in various research activities on snake and scorpion venom to explore their therapeutic potential.

Toxicology

The department of toxicology has been recognized as an internationally acclaimed Contract Research laboratory for past 20 years with an established global client base. The department has provided comprehensive studies for the registration of pharmaceuticals, agrochemicals, biocides, cosmetics, specialty chemicals, Medical devices and related products. All studies are conducted at department are in accordance with the regulatory requirements of the OECD, ICH, FDA, EMEA, OPPTS, BIS and ISO 10993.

Bacteriology

This department imparts training to graduates on anti-microbial efficacy testing of disinfectants as well as to the personnel from various government / semi-government organizations. The department carries out the bacteriological examination of water samples from various sources, testing of various types of water purifiers, *in vitro* anti-microbial testing of disinfectants and antimicrobial agents. Department also conducts lyophilisation of bacterial cultures. The department also carries out Anti microbial (anti bacterial and anti fungal) efficacy testing of anti microbial incorporated materials like ceramic tiles, fabric material plastic sheets, asbestos sheets, stainless steel tiles and oil paints etc. as per the Japanese Standard Specification also Rideal-Walker Coefficient (RWC) and Staphylococcus aureus Coefficient (SAC) testing of Phenolic disinfectant solution samples as per IS specification. The department is going to undertake the anti-bacterial and anti-fungal testing of disinfectant samples as per AOAC and EN (European Standards). The department also conducts various research activities for M.Sc. and Ph. D. students.

Chemotherapy

Chemotherapy Department is concerned with the research on synthesis, isolation, Chemical & Biological characterization of synthesized chemical compounds which are medicinally active intermediates. The department is affiliated to the University of Mumbai for MSc & PhD degree for Organic Chemistry. Currently three students are registered for PhD degree for Organic Chemistry and three students are registered for the M.Sc degree from Mumbai University. The Department has presented their research work in National & International Conferences and also published it in reputed journals.

The department has started short term training programme for one month for Post-graduate students of M.Sc. (Chemistry), B. Pharm., M.Pharm. The department conducts three days

workshop on 'Analytical Instrumentation Training' for under-graduates & post-graduate students. The department is also involved in testing activities of IR samples commercial & academic purposes. Recently two new Instruments, HPLC-High Performance liquid chromatography, GCMS-Gas chromatography mass spectrophotometer are installed in department. Hence facility for research students & commercial testing purpose is going to be provided by the Department.

Chemical Testing Department

The aim and objective of the Testing Unit is to analyze the alcoholic beverages like Indian Made Foreign Liquors (I.M.F.L.), Toddy, Country Liquors etc, denaturant (such as Benzene, Acetone, Crotonaldehyde, Diethylphthalate, Ethyl-Ether, Light Caoutchoucine, Pyridine Base, Toluene, Diethylamine), Bitterants (Denotarium Saccharide and Denotanium Benzoate), Colourants (Crystal Violet and Methelene Blue) to be added for preparing Ordinary Denatured Spirit (O.D.S.) and Special Denatured Spirit (S.D.S.) sent by State Government of Maharashtra.

Department also analyzes the samples of Special Denatured Spirit (S.D.S.), Ordinary Denatured Spirit (O.D.S.), French polish, Thinner, etc. sent by State Government of Maharashtra and to extend the expertise to State Excise Department of the Government of Maharashtra in respect of above referred activities.

Virology

As the title of department suggests the Department of Virology and Immunology functions in two major domains namely Virology and Immunology.

Under Virology, the Department carries out the Institutional mandate, working with viruses as ancient as Polio and Rabies, to novel entities like the pH1N1 (2009). Primarily, the Department is engaged in research on the growth, pathogenesis and interventions in various viral diseases. The Department is a part of the NCDC-IDSP Network for the surveillance of Influenza like Illnesses. A separate Bio safety Level-3 (BSL-III) facility is set up with the Department under the NCDC-World Bank-MoHSW project for pandemic-preparedness for Avian Influenza. Various evaluations are carried out on natural and synthetic moieties for their activity against viruses of pathologic importance. These evaluations have both for academic as well as commercial outcomes. The testing includes diagnosis of viral infections by classical culture methods, to novel PCR techniques.

Under Immunology domain, the Department aims at identifying the immune response to various viral and non-viral entities, by means of genomic or proteomic analysis. Here, differential expression of immune parameter genes (e.g. Cytokines, chemokines, growth factors), as well as proteins in various infections, is studied. The Department is also setting up in-vitro models for evaluating inflammation, immune-modulation and specific toxicity.

The Department is affiliated to the University of Mumbai & Maharashtra University Of Health Sciences (MUHS), Nasik, for M.Sc. and Ph.D. degrees and currently has Ph.D. students and 2 M.Sc. students carrying out research. The Department also undertakes several training programs at an undergraduate and post-graduate student level. These include the Annual Biotechnology Training Program and the Annual Course in Medical Virology (Viro-Vitals).

To sum up, Department of Virology and Immunology is one department in the Institute where classical microbiology and modern molecular biology methods blend seamlessly.

Clinical Pathology

Though the activities of this department can be said to have commenced with the starting of the Plague Research Laboratory in 1896, a separate Department of Clinical Pathology was established in the year 1905. From its very inception the department undertook studies on plague, diagnostic and investigational studies on almost the entire range of communicable diseases like cholera, malta fever (Brucellosis), typhoid, malaria, diphtheria, relapsing fever etc. which in their epidemic forms brought devastation to the mankind. The department covered a wide range of laboratory functions and was concerned with the diagnosis, patient care, and prevention of diseases.

At present Department is actively involved in Training, Research and Testing activities. It participates in training programmes like Annual Biotechnology Training and Viro-vitals. Department also train students for M.Sc. and Ph.D. degree in Microbiology and applied Biology affiliated to Mumbai University. The department has future plan of conducting training program for primary health care workers for operation theatre hygiene and industrial microbiology.

Department is actively involved in research on various infectious diseases like tuberculosis Methicillin Resistant Staphylococcus Aureus, Extended Spectrum β - Lactamase (ESBL) and Metallo β - Lactamase (MBLs). Department is also involved in biosynthesis of nanoparticles , checking anti-bacterial activity of Kombucha (Chinese tea) and Caffeine, development of diagnostic tests for Tuberculosis and herbal antituberculosis compounds.

The department has well established testing laboratory where following test are conducted like, hematology, serology, bacteriology, mycology and histopathology. It receives clinical samples from E.S.I.S. hospitals, govt. hospitals and public health dispensaries. Department also conducts antimicrobial, antimycobacterial and antifungal testing of synthetic compounds developed by the research centers, colleges and pharmaceuticals. Department conducts annual medical checkup of HITRT employees and other companies. Department conducts bacteriological investigation of post fumigation Operation theatre swabs received from various primary Health centers and rural hospitals. The department has future plan of introducing various serological tests for diagnosis of auto-immune diseases and other infectious diseases.

Biochemistry

Clinical biochemistry department performed the activities of training, research and testing assignments. The present activities of the department include the biochemical assay of clinical samples from hospitals, nursing homes and maternity centre, private medical practitioners and annual medical checkups of the government and corporate sectors. Clinical biochemistry laboratory is also involved in preclinical, clinical trial and reverse pharmacology of Ayurvedic herbal drugs, formulations and synthetic compounds. Department of clinical biochemistry also conducts workshops, seminars, symposia and conferences on oxidative Enzymopathy and vascular diseases.

Plant biochemistry department is performed the task of protocols development, nutrient media optimization, micro-propagation or mass-propagation pharmaceutically and industrially important plants through tissue culture technology. Plant biochemistry laboratory is also focused on extraction and purification of bioactive compounds from medicinal aromatic plants (M&Ps). Department of plant biochemistry conducts workshops on awareness of plant tissue culture, transgenic and medical molecular farming.

Training Section

The institute has offered various training programme for graduate and post graduate students of various colleges. During the year 2012-13, 252 students were given admission for Annual Biotechnology programme. 12 students were registered for viro-vital training programme, whereas 39 students completed short-term research projects. A list of recognized teachers at the institute is given in Appendix I. A list of students registered for M.Sc. and Ph.D. degrees and those who successfully completed their thesis and obtained their degrees is given in Appendix II and Appendix III respectively.

Haffkine institute has introduced a course in Basic Clinical Research Management & Regulatory Affairs from Jan 2009 onwards. Six batches of students successfully completed the above course and seventh batch commenced from April 2011. A total of 191 students have registered for the Basic Diploma in Clinical Research Management and Regulatory affairs course since January 2009.

Administration

The Governing Council presided over by the Honourable Minister for Medical Education, Govt. of Maharashtra, meets once a year. Apart from this, Executive Committee (Administration) meets regularly once a fortnight to provide smooth functioning of the Institute.

TRAINING

Haffkine Institute has been affiliated by the University of Mumbai for the M.Sc.by Research and PhD (Microbiology, Applied Biology, Biochemistry and Organic Chemistry) degrees and by the Maharashtra University of Health Sciences (MUHS), Nashik for PhD (Medical Microbiology and Medical Virology) degrees. The Institute has offered various training program for graduate and post graduate students of various colleges. In the year 2013-14 more than 330 students has been participated and trained under various training program. The details of all the training programs, research projects, List of Pg- teachers with their subject, list of visiting scientists along with their respective departments and list of students with their names and project titles are given in this report.

Sr. No.	Name of Course/ Workshop	No. of Days	Department/s Involved	No. of students trained / completed in the year 2013-14
1	Ph.D.	-	Institutional	01
2	M.Sc. (by Research)	-	Institutional	00
3	PG Diploma In Clinical Research Management and Regulatory Affairs	6 months	Institutional	18
4	Short Term Research Internship Program	6 Months	Institutional	22
5	Annual Biotechnology training Program	10 Days	Institutional	171
6	Medical Viro Vitals	7 Days	Virology	12
7	Workshop on Principles and Practices of Laboratory Animal Care	2 Days	Zoonosis - Animal Unit	26
8	Workshop On Covert Existence of Snakes	3 Days	Zoonosis - Animal Unit	11
9	Workshop on Enzymology	2 Days	Biochemistry	25
10	Workshop on Analytical Training for Instrumentation	3 Days	Chemotherapy	41
11	Hands on Techniques on Immunology and Virology	5 Days	Virology	27
12	Mission to control mosquito menace			
13	One day Training on "Identification of venomous and non venomous snakes first aid measures post snake bite			

Training programmes at Haffkine Institute completed during 2013-2014

1 VIROVITALS

- a. The course encompasses concepts in classical as well as contemporary Virology. It covers concepts in Clinical Virology and the Molecular Principles behind it. The Program uses Didactic Lectures, Interactive Discussions, Demonstration Practical sessions and Hands-on Experiments to make the participants sensitize the participants with the latest in the field of Medical Virology.
- b. Under this training program, 11 students (MBBS/MD/M.Tech) participated, generating a revenue of Rs. 33,000/-.
- c. This course was carried out by the Department of Virology in March 2014.

2. HANDS ON TRAINING IN TECHNIQUES IN VIROLOGY AND IMMUNOLOGY

- a. Complementary to the VIROVITALS training program which is predominantly a lecture-demo series, this program aims to provide in depth knowledge in virological techniques, by means of providing hands-on training experience to the participants.
- b. Under this training program, 27 students had participated, generating a revenue of Rs. 1,35,000/-.
- c. This course was carried out by the Department of Virology in June 2013.

3. Analytical Training for Instrumentation

- a. The Department of Chemotherapy, Haffkine Institute, shall be conducting Three days Training Programs in Fundamental and Applied aspects of analytical Chemistry for students of University of Mumbai. Students who are enrolled in Organic or Physical or Analytical Chemistry for their Masters Degree are invited to apply for the same.
- b. **Details of Analytical Training for Instrumentation course:**

BATCH	TIME PERIOD	TOTAL STUDENTS
FIRST	15/05/2013 to 17/05/2013	19
SECOND	27/05/2013 to 29/05/2013	14
THIRD	17/06/2013 to 21/06/2013	08

- c. **Department involved: Chemotherapy Department**

4. Workshop on “Mission to Control Mosquito Menace”

- a. This was conducted for college students on 6.06.13/ 10.07.13 / 14.08.13 and Number of students – 47 under the guidance of Dr. Mira Ramaiya and Dr. Saroj Bapna .
- b. In vitro cultivation of malaria parasite training provided to students.(No. of students – 3)

5. Two day workshop on “Principle and Practices of Laboratory Animal Care.”

- a. Workshop consists of lectures, demonstrations and hands on training to cover the practical aspects of the course. Topics to be covered in the workshop are part of graduate and post graduate curricula. Therefore, it is anticipated that this workshop will benefit students, teachers and also the researchers working in this field of Animal experimentation.
- b. **No. of students trained**

Year	2013-14	Dates of workshop	No of students attended
Batch- I		4/5/2013 -5/5/2013	16
Batch II		15/6/2013 -16/6/2013	10
TOTAL			26

- c. **Department/s involved**
 - i. Venomous animal unit, Department of Zoonosis
 - ii. Department of Toxicology

6. Two day workshop on “Introduction to covert Existence of Snakes”

- a. The purpose of the workshop is to describe how to understand the behavior, physiology, health care procedures of the Snakes on field and in the captivity. Workshop consists of lectures, demonstrations and training to cover the practical aspects of the course. Topics to be covered in the workshop are part of graduate and post graduate curricula. Therefore, it is anticipated that this workshop will benefit students, teachers and also the researchers working in this field.
- b. **No. of students trained**

Year	2013-14	Dates of workshop	No of students attended
Batch- I		11/05/2013 to 12/05/2013	11

- c. **Department/s involved**
 - i. Venomous animal unit, Department of Zoonosis

7. One day Training on “Identification of venomous and non venomous snakes first aid measures post snake bite”.

- a. The purpose of the training is to provide basic knowledge to the sanitary inspector students (Diploma holders) to differentiate between venomous and non venomous snakes and how to provide the first aid measure in snake bite cases. Training consists of lectures, demonstrations. Topics to be covered in the workshop are part of diploma curriculum of the sanitary inspectors.
- b. **No. of students trained**

Year 2013-14	Dates of workshop	No of students attended
Batch- I	27.01.2014	60
Batch –II	28.01.2014	60
Batch – III	29.01.2014	60
Batch – IV	30.01.2014	60
Batch - V	31.01.2014	60
Batch - VI	03.02.2014	59
Total		359

c. Department/s involved

- i.** Venomous animal unit, Department of Zoonosis

8. Training provided to various institutes, colleges, organization, government and semi government firm, primary and secondary high school on identification of venomous and non venomous snakes, First AID measures after snake bite. The total number of visitors visited during the period 1st April 2013 to 31st 2014 is as follows:

Sr. No.	Date	No. of Visitors attended
1	April 2013-March 2014	2220

9. Enzymology Workshop

- The course encompasses theoretical as well as practical concepts in the field of ENZYMOLOGY that will help in sharpening knowledge from basics to recent findings. Workshop was comprised of lectures and demonstrations as well as hands on training which was helpful to students for sharpening their practical knowledge of enzymes as well as for their graduate and post graduate curriculum. The topics of the lectures and practical for the workshop were the different concepts of Enzymes like Enzyme kinetics, Isoenzymes, Enzyme purification, Restriction enzymes, Metabolic Newborn Screening, Enzyme Deficiency, Directed Evolution of Enzymes, Enzymopathy etc.
- No. of students trained: 25**
- Departments involved:** Workshop conducted by Department of Biochemistry. Dept. of Virology and chemotherapy for the instruments for demonstrations.

10. PG Diploma in Clinical Research Management and Regulatory Affairs:

- Features: How new drugs are discovered, designed, developed, and evaluated in Pharma Industry; Career path for Clinical Research PGs: Practical aspects of Clinical Trials and Research method: Trial design and Statistical basis: case studies. Legal, statutory and regulatory aspects of New Drug evaluation: dossiers; Safety issues and pharmacovigilance: Ethical aspects and GCP; Indian Drug Laws: Trial management: Medical writing
- No. of students trained: 22**

11. Short Term Research Internship Program (STRIP):

- The Short Term Research Internship Program offers short term (4 – 6 months) research opportunities primarily to students who require completing dissertations for the partial fulfilment of their B. Tech, M. Tech, B.E or M. Sc degrees. Selected candidates get to work on projects encompassing various multi-disciplinary areas of Biological and Chemical Sciences.
- No. of students trained: 23**

List of Guides for M.Sc. and Ph.D. at Mumbai University

Sr. No	Name Of Guide	Subjects	Degrees
1	Dr. Abhay Chowdhary	Microbiology & Applied Biology	M.Sc./ Ph.D.
2	Dr. (Mrs.) Ranjana A. Deshmukh	Microbiology & Applied Biology	M.Sc./ Ph.D.
3	Dr. (Mrs.) Sunita D. Deshpande	Microbiology	M.Sc./ Ph.D.
4	Dr. Anil Bobde	Organic Chemistry	M.Sc./ Ph.D.
5	Dr. A. Rosalind Marita	Biochemistry	M.Sc./ Ph.D.
6	Dr. (Mrs.) Usha Dave	Applied Biology & Biotechnology	M.Sc./ Ph.D.
7	Dr. Pratibha Chaturvedi	Applied Biology	M.Sc./ Ph.D.
8	Dr. Mira Lalji Ramiya	Applied Biology	M.Sc.
9	Dr. Shashikant Vaidya	Microbiology & Applied Biology	M.Sc.
10	Dr. Sweta Kothari	Microbiology & Applied Biology	M.Sc.

List of Guides for Ph.D. at MUHS, Nashik

Sr. No	Name Of Guide	Subjects	Degrees
1	Dr. Abhay Chowdhary	Microbiology & Applied Biology	Ph.D.
2	Dr. (Mrs.) Ranjana A. Deshmukh	Microbiology & Applied Biology	Ph.D.
3	Dr. (Smt) Sunita D. Deshpande	Microbiology & Applied Biology	Ph.D.

List of Indian Visiting Scientists & Adjunct Professor:

Sr. No.	Name & Qualification	Designation	Department
1	Dr.(Smt.) Mrudula A. Phadke MD, DCH, FIAP, MR.CP(UK)	Visiting Scientist and Adjunct Professor	Virology
2	Dr. (Smt.) R. A. Deshmukh MD, Ph.D.	Visiting Scientist and Adjunct Professor	Virology
3	Dr. H.S. Palep MD	Visiting Scientist and Adjunct Professor	Chemotherapy
4	Dr.(Smt.) Jaya R. Deshpande MD	Visiting Scientist and Adjunct Professor	Clinical Pathology
5	Dr.(Smt.) Sunita D. Deshpande M.Sc., Ph.D.	Visiting Scientist and Adjunct Professor	Clinical Pathology
6	Dr.Rrajesh V. Warke Ph.D. (Biomedical Sci.)	Visiting Scientist and Adjunct Professor	Virology
7	Dr. Usha P. Dave Ph.D., DHA.	Visiting Scientist and Adjunct Professor	Biochemistry
8	Dr. Kedar Bhide	Visiting Scientist and Adjunct Professor	Zoonosis
9	Dr. Prasad S. Koka	Visiting Scientist and Adjunct Professor	Virology/ Immunology
10	Dr. Sheo Mohan Singh	Visiting Scientist and Adjunct Professor	Immunology
11	Dr. Narendra Bhatt	Visiting Scientist and Adjunct Professor	Chemotherapy
12	Dr. Vidya Arankale	Visiting Scientist and Adjunct Professor	Virology
13	Dr. C.S. Patil	Visiting Scientist and Adjunct Professor	Microbiology
14	Dr. R.D. Kulkarni	Visiting Scientist and Adjunct Professor	Microbiology
15	Dr. Tapan Dhole	Visiting Scientist and Adjunct Professor	Virology

List of International Visiting Scientists:

Sr. No.	Name	Country of Origin
1	Dr. Prakash S. Thombare	United States of America
2	Dr. Lance Robert Peterson	United States of America
3	Dr. Irin Bosh	United States of America
4	Dr. Ellen Jo Baron	United States of America
5	Dr. Deshratna Asthana	United States of America
6	Dr. Harshavardhan Sheware	Australia
7	Dr. Peter Strong	England

List of Completed project:**a) M.Sc. (By Research) :**

Sr. No.	Name	Subject	Guide	Project Title
1	NIL	NIL	NIL	NIL

b) Ph.D. :

Sr. No.	Name	Subject	Guide	Project Title
1	Mr. Ritwik Dahake	Microbiology	Dr. (Smt.) R. A. Deshmukh	"Study of Drug Resistant HIV-1 in the Patient cohort in Mumbai"

c) Short Term Research Internship Program (STRIP):

Sr. No.	Name of The Student	Project Title
1	Ms. Megha Maru	"A vector construct of domain III protein as a vaccine candidate for Dengue Serotype 1."
2	Mr. Roshan Mammen	"Comparative evaluation of the anit-inflammatory activity of plant extracts, organic compounds and their combinations."
3	Ms. Soumya Soman	"Comparative in-silico analysis of HIV and HBV reverse transcriptase: Structure and Function."
4	Ms. Tejashree More	"Study of neutralization of enzymatic activity of <i>Daboia Russelii</i> venom by various plant extracts and their combinations using invitro methods."
5	Ms. Pooja Das K.	"Assessment of Metal responsive gene expression in experimental Murine Malaria."
6	Ms. Mahwish Kahan	"Assessment of Qualitative and Quantitative Antibody Responses to J.E. Vaccination with BCG as an adjuvant, in Murine Model."
7	Ms. Anjali Narayakkadan	"Comparative evaluation of the anit-inflammatory activity of plant extracts, organic compounds and their combinations."
8	Ms. Aanchal Shah	"Comparative in-silico analysis of HIV and HBV reverse transcriptase: Structure and Function."
9	Mr. Sumit Pantavne	"Study of Antibiotic Susceptibility, Biofilm Formation & Heavy Metal Resistance in Clinical Isolates of <i>Pseudomonas areuginosa</i> ."
10	Mr. Anurag Bakhle	"Evaluation of Allele Specific PCR as a tool for the assessment of resistance in <i>Mycobacterium tuberculosis</i> ."
11	Mr. Hardik Ramani	"To study of Antibiotic Susceptibility, Biofilm Formation , Heavy Metal Resistance and Plasmid profiling in <i>E.Coli</i> & <i>Klebsiella Spp.</i> Isolated from different drinking water sources."
12	Ms. Shradha Surve	"Molecular Characterization and Secondary Metabolites of <i>Vigna unguiculata</i> (Cowpea)."
13	Ms. Binal Jakhia	"Application of Artificial Neural Network Towards the

		Determination of Presence of Disease Conditions in Liver Ultrasound Images.”
14	Ms.Ashita Shetye	“Application of Artificial Neural Network Towards the Determination of Presence of Disease Conditions in Kidney Ultrasound Images.”
15	Ms. Ketaki Karkhanis	“Application of Artificial Neural Network Towards the Determination of Presence of Disease Conditions in Liver Ultrasound Images.”
16	Mr. Suvigya Jain	“Application of Artificial Neural Network Towards the Determination of Presence of Disease Conditions in Kidney Ultrasound Images.”
17	Ms. Kaushiki Prabhudesai	“Cloning of Japanese encephalitis virus Domain III Immunogenic gene.”
18	Ms. Vidhushi Chitalia	“Study of Effects of Sub-inhibitory Concentrations of Antibiotics on Biofilm Formation by Extended Spectrum β -Lactamases (ESBL) Producing Clinical Isolates.”
19	Ms. Priyanka Singh	“Biological Evaluation of Different Benzothiazole Derivatives.”
20	Ms. Madhuri Yeole	“L-Cysteine functionalized gold nanoparticles as drug delivery vectors for improvising anti-retroviral treatment for HIV.”
21	Ms. Anjani Gupta	“Evaluation of Anti-bacterial and Anti-cancer Activities of Extracts of Graviola Leaves in Various Solvents.”
22	Ms. Dipti Thatavarthy	“Invitro Biochemical Characterization and Anticancerous Property of Common Krait Snake Venom.
23	Ms. Vaishnavi Raman	“Biochemical Characterization of Saw Scaled viper Venom.”

List of Ongoing projects:**a) M.Sc. (By research) Students Registered at Mumbai University:**

Sr. No.	Name	Subject	Guide	Project Title
1	Ms. Kanchan Kathale	Applied Biology	Dr. Abhay Chowdhary	"To study the Prevalance and Characterization of Dengue Virus in and Around Mumbai."
2	Mr. Paras Mahale	Applied Biology	Dr. Mira Ramaiya	"Comparative Analysis of Different Methods for Diagnosis of Malaria."
3	Ms. Raksh Shinde	Applied Biology	Dr. Mira Ramaiya	"Insecticide Resistant Gene Diversity in Mosquito Larvae."
4	Ms. Tehameena Mukadam	Microbiology	Dr.Sunita Deaspande	"Characterization ad Assessment of Antimicrobial and Antioxidant Activity of Kombucha."
5	Mr. Jayshankar Sharma	Microbiology	Dr. S. P. Vaidya	"Comparative Analysis of Different olecular Methods for Diagnosis of Multi-Drug Resistance Tuberculosis."
6	Mr. Rshil Bhatt	Applied Biology	Dr. Sweta Kothari	Evaluation of Neuroinflammation due to different Dengue Virus Serotypes
7	Mr. Gaurav Desai	Chemistry	Dr. A.S. Bobade	"Synthesis of some Quinoline Derivatives as Potent Anti-Microbial Agents."
8	Mr. Pravin Sadashiv Chowdhary	Chemistry	Dr. A.S. Bobade	"Synthesis and evaluation of Anti-Microbial Activity of Substituted Coumorin Derivatitives."

b) Ph.D. students**i) Ph.D. Students Registered at MUHS Nashik:**

Sr. No.	Name	Subject	Guide	Project Title
1	Ms. Devanshi Gohil	Medical Microbiology	Dr. Ranjana Deshmukh	"Molecular characterization of 2009 H1N1 pandemic influenza and seasonal influenza viruses from patients in Mumbai region."
2	Ms. Suvarna V. Joshi	Medical Microbiology	Dr. Abhay Chowdhary	"Assesment of Novel Molecular Methods for the Diagnosis of Tuberculosis."
3	Ms. Shraddha M. Mehta	Medical Microbiology	Dr. Abhay Chowdhary	"Study of Neuronal Proteome in Prognosis of Rabies in Murine Model."
4	Mr. Rahul A. Gosavi	Medical Microbiology	Dr. Ranjana Deshmukh	"Assesment of Dendritic Cell vaccine as a Potential Immunotherapeutic Agent in Malaria."
5	Mr. Sahil G. Kulkarni	Medical Microbiology	Dr. Abhay Chowdhary	"Assesment of BCG as an Adjuvant In Enhancing the Efficacy of Japanese Encephalitis Virus Vaccine."
6	Mr. Ajit A. Kulkarni	Medical Microbiology	Dr. Ranjana Deshmukh	"Immunogenicity study of recombinant Dengue gene construct in mice."
7	Mr. Arunagiri Subramanian	Medical Microbiology	Dr. Ranjana Deshmukh	"Molecular characterization of Methicillin Resistant Staphylococcus aureus (MRSA) isolates in Mumbai."
8	Mr. Rohan Kesarkar	Medical Microbiology	Dr. Abhay Chowdhary	"Study of Potential Therapeutic activity of Gold Nanoparticles against HIV"
9	Mr. Sandeepan Mukharjee	Medical Microbiology	Dr. Abhay Chowdhary	"Assesment of Plant Proteins/ Peptides as a potential Antiviral Agents"
10	Mr. Shrikant P. Gajbhiye	Medical Microbiology	Dr. Abhay Chowdhary	:Microbiological and Immunological studies on Panchagavya classes and its herbal formulations"

ii) Ph.D. Students Registered at Mumbai University:

Sr. No.	Name	Subject	Guide	Project Title
1	Mr. Chinmay Oroskar	Applied Biology	Dr. Abhay Chowdhary	"To Asses the contribution of Sweat inn Parasite Induced Attractiveness to Insect Host In Malaria Patients.'
2	Mr. Apurva Gode	Applied Biology	Dr. Abhay Chowdhary	"Isolation and Characerization of <i>Toxoplasma gondii</i> antigens and assessment of It's tumer suppression Activity."
3	Mr. Rahul Chavan	Applied Biology	Dr. Abhay Chowdhary	"Characterization and assesment of Diffrential Proteome in Patients with Acute Respiratory Infection."
4	Mr. Vivek Vishve	Applied Biology	Dr. Abhay Chowdhary	"Production and immobilization of Lipase from <i>Pseudomonas spp.</i> & It's applications."
5	Mr. Omkar Lele	Microbiology	Dr. Abhay Chowdhary	"Assesment of Effects of Subinhibitory Concentrations of Antibiotics on <i>Pseudomonas aeruginosa</i> ."
6	Ms. Purna Charan	Applied Biology	Dr. Abhay Chowdhary	"To Study siRNA Associated suppression of Rabies Virus Infection and Asses It's Therapeutic Potential."
7	Ms. Mansi Malik	Applied Biology	Dr. Abhay Chowdhary	"Interplay of trace Elements in the Pathophysiology of Murine Model of Malaria."
8	Ms. Richa Lakhotiya (Karnani)	Applied Biology	Dr. Abhay Chowdhary	"Synthesis, Characterization and Evaluation of anti-Microbial Activity of Silver Nanoparticles."
9	Mrs.Pallavi Chowdhary	Applied Biology	Dr. Abhay Chowdhary	"Comparative assessment of Immunomodulatory Activities of Plant Extracts and their synthesized Nanoparticles."
10	Ms. Pialy P. Chatterjee	Microbiology	Dr. Abhay Chowdhary	"Assessment of interferon induced transmembrane (IFITM) gene & protein expression in human influenza infection."
11	Mr. Soumen S.	Microbiology	Dr. Abhay	"Assessment of Potential

	Roy		Chowdhary	Anti Viral activity of Indian Medicinal Plants against Rabies Virus causing Encephalitis."
12	Mr. Ashish Asrondkar	Chemistry	Dr. A.S. Bobade	"Synthesis and Study of Heterocyclic Compounds as a Possible Anti-Microbial Agents."
13	Ms. Vrushali Patil	Chemistry	Dr. A.S. Bobade	"Synthesis and Study of Heterocyclic Compounds as a Possible Therapeutic Agents."
14	Ms. Neha Mishra	Chemistry	Dr. A.S. Bobade	"Synthesis and Biological Evaluation of Heterocyclic Entities as possible Antimicrobial Agents."
15	Mr. Rohan Dudhale	Microbiology	Dr. Sunita Deshpande	"Plasmid Diversities in <i>Pseudomonas aeruginosa</i> from different clinical sources."
16	Mr. Kapil Punjabi	Microbiology	Dr. Sunita Deshpande	"Biosynthesis of Nanoparticles & It's Potential Therapeutic Applications."
17	Ms. Gauri R. Patade	Biochemistry	Dr. A. R. Marita	"Role of Inflammation in obesity and type 2 diabetes."
18	Mr. Nikhil Kasarpalkar	Applied Biology	Dr. Usha P. Dave	Serum brain derived neurotrophic factor (BDNF) and gene mutation in autism spectrum disorders (ASD).

c) Short Term Research Internship Program (STRIP):

Sr. No.	Name of The Student	Department
1	Ms. Disha Subhash Aggarwal	Zoonosis
2	Ms. Nupur Deshpande	Zoonosis
3	Mr. Sushant Suchit Karnik	Zoonosis
4	Ms. Chandni Vinod Bhanushali	Zoonosis
5	Ms. Kashmira Ravindrakumar Davane	Bacteriology
8	Ms. Ashwini Ashok Prasad	Toxicology
9	Mr. Priyank Chetan Dhakan	Chemotherapy
10	Ms. Gauri Ashok Shinde	Biochemistry
11	Mr. Akshat Porwal	Biochemistry
12	Mr. Ajinkya Avinash Deshpande	Virology
13	Mr. Yash Manish Karia	Virology
14	Ms. Priyanka Shivagouda Naik	Virology

c. OTHER TRAINING ACTIVITIES:

1. Dr. Sweta T Kothari had been invited as an External Examiner for M.Tech (Biotechnology) - SEM III Padmashree Dr. D.Y.Patil University, Department of Biotechnology & Bioinformatics on 9th and 11th December 2013.
2. Dr. Sweta T Kothari had been nominated for National Training Programme on Entrepreneurship Development and Management For Women Scientists and Technologists in Government Sector, held at Entrepreneurship Development Institute, Gandhinagar, Gujrat, during February 17-24, 2014.
3. Sandeepan Mukherjee was invited as a visiting faculty at the Department of Bio-Analytical Sciences, Birla College, kalyan, to conduct lectures in Bio-informatics for their M.Sc program.
4. Sandeepan Mukherjee was invited as a visiting faculty at the Department of Bio-Physics, University of Mumbai, to conduct lectures in Bio-informatics for their M.Sc program.
5. Dr. Shital U. Vasave, Senior Scientific Officer, Clinical Pathology Department delivered Guest lecture on First Aid and Snake Bite Management on 11th May 2013
6. Foundation Training Course for Class-I officers in medicinal education organized by Yashada, Pune on Behalf of state government of Maharashtra.
Course duration:
Phase I: 17th Feb to 1st March at Pune
Phase II: 2nd March to 23rd March at Haffkine
Phase III: 24th March to 31st March at Pune
Phase III 24th March to 31st March completed project on “SWOT” Analysis of Haffkine Institute during this training course.

Dr. Abhay Chowdhary has delivered the following guest talks in the year 2013-2014

SR. NO.	TITLE OF TALK	EVENT	VENUE & DATE
1.			
2.			
3.			
4.			

Mr. Sandeepan Mukherjee has delivered the following guest talks in the year 2013-2014

SR. NO.	TITLE OF TALK	EVENT	VENUE & DATE
1.	Mathematics in Biological Sciences	IEEE-ISAAC	Thadomal Sahani Engineering College, Mumbai. 02/10/2013
2.	Entrepreneurship options in Biotechnology	BioBuzz: 6th National Biotechnology Conference	Pad. Dr. D. Y. Patil University, Navi Mumbai. 21/09/2013
3.	Bioinformatics	Workshop on Biotechniques in Bioinformatics	Guru Nanak Khalsa College, Mumbai. 27/01/2013
4.	Vaccines: The Arts, The Science & The Commerce	Tuesday Colloquium	Centre for Excellence in Basic Sciences, University of Mumbai. 21/01/2014
5.	Vaccines: The Arts, The Science & The Commerce	ASET Colloquium	TIFR, Mumbai 28/02/2014
6.	Diagnostics: The Science & The Technologies	Perception 2014: Annual Biotechnology Fest	Karmaveer Bhaurao Patil College, Navi Mumbai. 15/02/2014

Mr. Karthik Kalyan has delivered the following guest talks in the year 2013-2014

SR. NO.	TITLE OF TALK	EVENT	VENUE & DATE
1.	Academia –Industry Partnerships: Bridging the Gap Between Them	Industry – Academia Meet	The Institute of Science, Church Gate, Mumbai. 01/02/2014

COMPLETED PROJECTS

PHD

1. Study of Drug-Resistant HIV-1 in the Patient Cohort in Mumbai

Investigator	Mr. Ritwik Dahake
Guide	Dr. Ranjana A. Deshmukh
Co-guide/mentor	Dr. Abhay Chowdhary

The study was aimed at determining the status of drug-resistant HIV-1 in the Indian sub-population in order to provide significant data to enable minimizing the infectivity of drug-resistant HIV that may be prevalent. The study managed to isolate 7 (23.33%; 7/30) drug-resistant HIV-1 variants prevalent in the patient cohort in Mumbai. Genotypic drug resistance assay revealed that resistance to Reverse Transcriptase Inhibitors (NRTIs and NNRTIs) was observed in the HIV isolates. Four isolates (57.14% (4/7)) had drug resistance mutations to NRTIs while 2 isolates (28.57% (2/7)) had drug resistance mutations to NNRTIs conferring resistance of varying degrees (low-, intermediate-, high-level) to either one or more of the following drugs: lamivudine, abacavir, didanosine, emtricitabine, tenofovir, efavirenz, nevirapine, zidovudine and stavudine. Discordance in the genotypic resistance patterns between plasma HIV samples and the isolates obtained from these samples is another factor that may be considered for further interpretation of the emergence of HIV drug resistance (Table 1).

HIV isolate	Genotypic Resistance	Phenotypic Resistance
HI/4C	ND	Susceptible to AZT
HI/14C	D4T, 3TC, ABC, DDI, FTC, TDF	ND
HI/15C*	Susceptible to AZT, D4T, 3TC	D4T, 3TC
HI/23C*	EFV, NVP	AZT, D4T, 3TC
HI/35C	ND	AZT, D4T, 3TC
HI/53C	ABC, AZT, TDF, 3TC, D4T, DDI, FTC, EFV, NVP	AZT, D4T, 3TC
HI/60C*	ABC, DDI	AZT, D4T, 3TC

Table 1: Discordance between Genotypic and Phenotypic Resistance Patterns of HIV isolates

Key: stavudine (D4T), lamivudine (3TC), abacavir (ABC), didanosine (DDI), emtricitabine (FTC), tenofovir (TDF), efavirenz (EFV), nevirapine (NVP), zidovudine (AZT); ND: not determined; *: discordance observed; bold letters depict discordance between genotypic and phenotypic assays

Further, the study also raised a discussion on the possible mechanism of transmitted or primary HIV-1 drug resistance in the Indian sub-population that is either on first line therapy or essentially naïve to protease inhibitor drugs. Genotypic resistance mutations leading to Protease Inhibitor (PI) resistance were found to be present in the plasma HIV samples from the drug naïve group, implying that drug naïve patients may have been harbouring primary or transmitted drug-resistant HIV-1.

In addition, the study determined the efficacy of commercially available experimental moieties (Nanoparticles and *Jatropha curcas* Linn. leaf extracts) as cost effective alternatives to currently

available anti-HIV drugs and the synergistic activity of the experimental moieties with currently available anti-HIV drugs. It was observed that Gold particles coated with PVP + Glycerol and Carbon Nanobeads coated with PVP + Glycerol, showed the maximum inhibition of p24 antigen (77.78%). With *Jatropha curcas* Linn., the ranges of IC₅₀ values for aqueous leaf extracts were 0.0255–0.4137 mg/mL (Selective index = 705.86 ± 438.33) while for the methanolic leaf extracts were 0.00073–0.1278 mg/mL (Selective index = 19095.34 ± 17709.64).

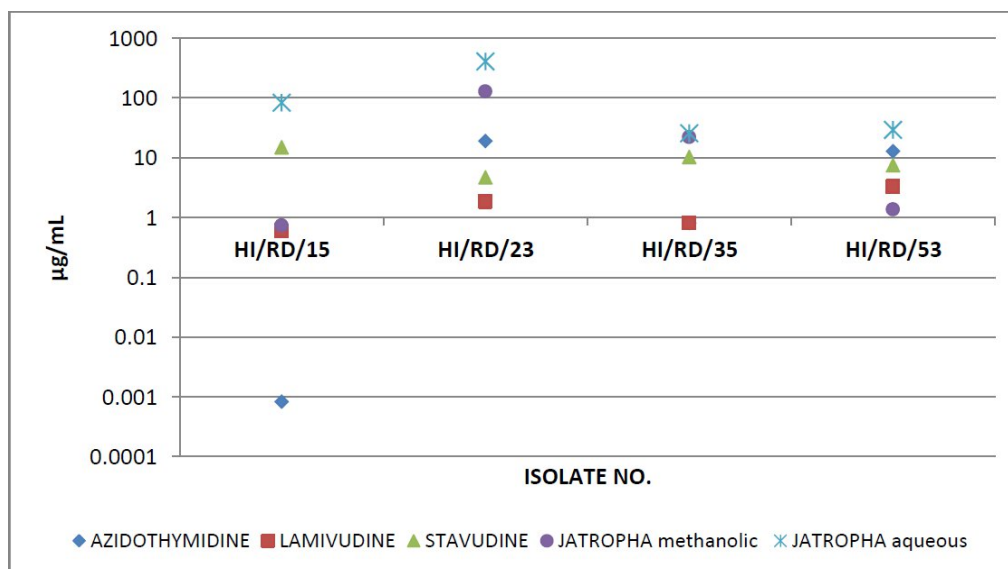


Figure 1: IC₅₀ values of drugs v/s *Jatropha curcas* Linn. plant extracts

To conclude, the study has managed to determine the presence of drug resistance and also isolate drug-resistant HIV-1 from the patient cohort in Mumbai. The study has also evaluated that nanoparticles and *Jatropha curcas* Linn. have prospective anti-viral and probable entry inhibitory activity against potentially drug-resistant HIV-1 and that these experimental moieties have favourable implications on the management of HIV/AIDS.

SHORT TERM RESEARCH INTERNSHIP PROGRAM

1. A Vector Construct Of Domain III Protein As A Vaccine Candidate For Dengue Serotype-1

Investigator	Megha P. Maru
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	Ajit Kulkarni, Dr. Sweta Kothari

In India, dengue infections are endemic for over two centuries. Dengue has been an urban disease but now has spread to rural areas of India as well. All four Dengue virus types circulate in India and cause epidemics. In recent years, co-circulation of multiple Dengue virus serotypes is being increasingly reported with concurrent severe infections like DHF and DSS with an increasing frequency of outbreaks. This is leading to hospitalization large number of people in a localized area. In India, these cases have accelerated enormously in the last two decades. EDIII has emerged as a potential vaccine candidate because of its following important characteristics: (a) EDIII is accessible on virion surface and exposed to immune cells. (b) Serotype specific neutralizing epitopes are present on this domain, which induce serotype specific neutralizing antibodies against Dengue virus. (c) EDIII possesses a very low intrinsic potential for eliciting cross-reactive antibodies against heterologous Dengue virus serotypes, implicated in severe pathogenesis thereby potentially avoiding antibody dependant enhancement (ADE). The proposed project involves the development of recombinant gene construct having envelope Domain III (EDIII) gene region of dengue serotype 1 and its protein expression in cell line.

Major breakthrough of the project

- Recombinant vaccine based on envelope domain III has been constructed for dengue serotype 1.
 - Protein expression has been tested in BHK-21 cell line by Polyacrylamide gel electrophoresis.
-

2. Application of Artificial Neural Networks Towards The Determination of Presence of Disease Conditions In Ultrasound Images of Kidney

Investigator(s)	Mr. Suvigya Jain and Ms. Ketki Kharkanis
Name of college	D.Y. Patil
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	Mr. Karthik Kalyan

Ultrasound (US) imaging modality is an important tool for diagnosis of kidney diseases such as Chronic Kidney disease, Renal Calculus and Cortical Cyst. It is easy to perform because of its non-invasive nature and lower costs. However due to the use of various ultrasound equipments, the image of ultrasound is prone to several noises such as ‘Speckle Noise’, which makes the diagnosis of disease conditions difficult for biomedical specialist such as radiologists. The accuracy of visual observation depends on the expertise of radiologists; however it is highly subjective. In order to provide more objective analysis and diagnosis, various features have been extracted from kidney ultrasound images. In this study many important features of ultrasound kidney images have been extracted such as Intensity histogram (IH) feature, Invariant moments (IM), Gray level co-occurrence matrices (GLCM), Gray level run length matrices (GLRLM) and ‘COMBINED’ feature set was develop from combination of all the four features. In total, 48 features of each image were calculated. Classification of ultrasonic kidney images is studied utilizing these extracted features by means of feature extraction methods and then optimal feature amongst them were selected by means of feature selection using a tool known as Waikato Environment for Knowledge Analysis (WEKA). Selected features from these methods are used to classify two sets of ultrasound kidney images – Normal, abnormal (cyst, Chronic Kidney disease, renal calculus). A neural network (ANN) based pattern recognition tool is employed to evaluate the performance of each feature on their classification accuracy rate.

Major breakthrough of the project

In this project we have managed to develop an efficient neural network based software system that could aid the biomedical specialists with the interpretation of kidney ultrasound images with more accuracy. The ANN based software system was also able to eliminate naturally present noises in US images.

3. Application Of Artificial Neural Networks Towards The Determination Of Presence Of Disease Conditions In Ultrasound Images Of Liver

Investigator	Ms. Binal Jhakia and Ms. Ashita Shetty
Name of college	D.Y. Patil
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	Mr. Karthik Kalyan

This work presents a comparative study of various texture features extracted from liver ultrasonic images by employing Multilayer Perceptron (MLP), a type of artificial neural network, to study the presence of disease conditions. An ultrasound (US) image shows echo-texture patterns, which defines the organ characteristics. Ultrasound image of liver disease conditions such as 'Fatty liver', 'Cirrhosis' and 'Hepatomegaly' produce distinctive echo patterns. However, various ultrasound imaging artifacts and speckle noise, make these echo-texture patterns difficult to identify and often hard to distinguish visually. Here, based on the extracted features from the ultrasonic images, we employed an artificial neural network for the diagnosis of disease conditions in liver and finding of the best classifier that distinguishes between abnormal and the normal conditions of liver. The results obtained show that the overall performances of all the features were average as compared to the 'Mixed feature set', which showed an excellent rate of accuracy for the training data set. The Gray-level Run Length Matrix (GLRLM) feature shows better results when the network was tested against unknown data.

Major breakthrough of the project

Naturally the Liver US images are prone to a lot of noise factors. In this project we have managed to develop an efficient ANN based software system that could aid biomedical specialists with the interpretation of liver US images which could eliminate the noise factors in US images thereby leading to more accuracy.

4. Study of effects of Sub-inhibitory Concentrations of antibiotics on Biofilm formation by Extended Spectrum β -lactamases (ESBL) producing clinical isolates

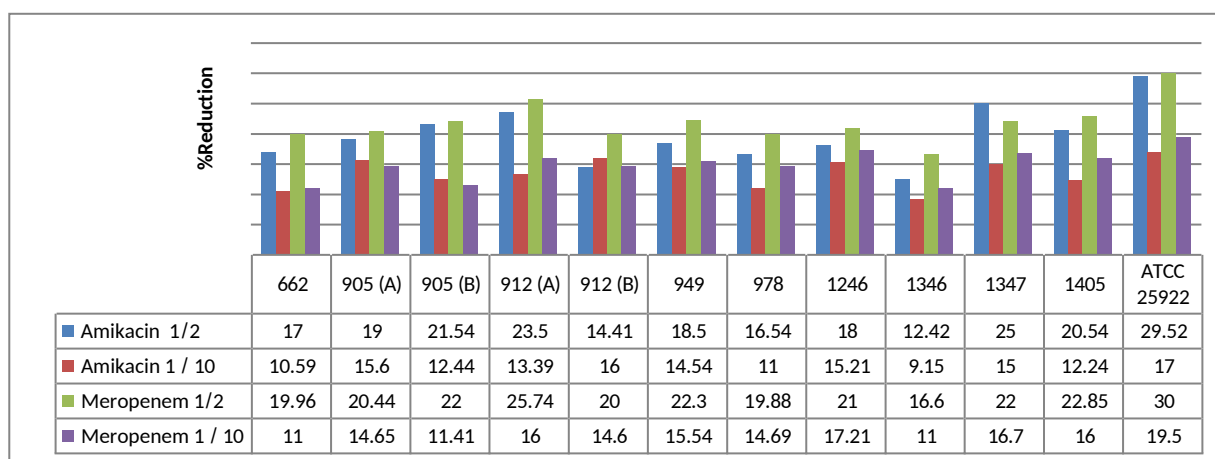
Investigator	Ms. Vidushi Chitalia
Name of college	D.Y. Patil
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	Mr. Omkar Lele

Enterobacteriaceae pathogens producing a spectrum of Extended β -Lactamases have been responsible for numerous outbreaks of infection throughout the world and thus pose challenging infection control issues. Another factor associated with increased drug resistance is production of Biofilms. The formation of biofilms on surfaces can be regarded as a universal bacterial strategy for survival and for optimum positioning to effectively use available nutrients. Microbial biofilms have been associated with a lot of persistent infections which respond poorly to conventional antibiotic therapy. Sub-inhibitory concentrations (sub-MICs) of antibiotics, although not able to kill bacteria can influence bacterial virulence and biofilm formation significantly. The transcriptional modulation by commonly used antibiotics could lead positive consequences during the treatment of bacterial infections in human hosts, e.g. antibiotics will help in attenuating the virulence factors and biofilm formation of bacteria and thus improving clinical outcome while treatment.

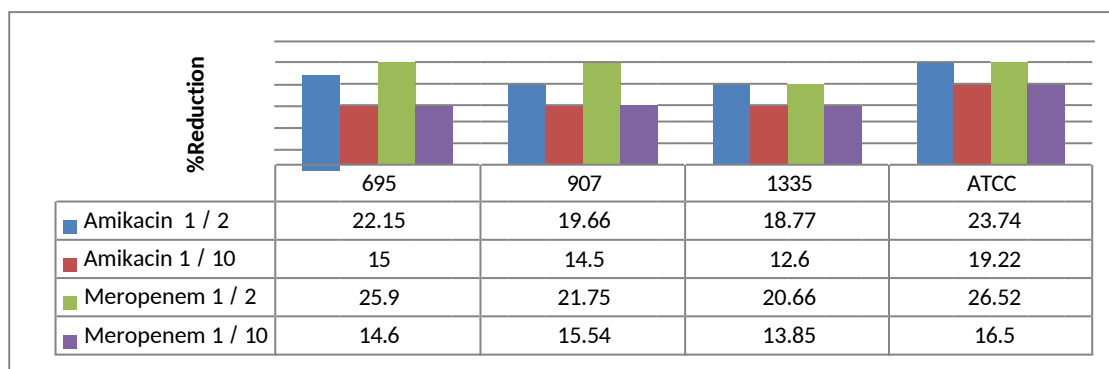
This study proposes to determine the effects of sub-inhibitory concentrations of Amikacin and Meropenem on biofilm formation by ESBL producing gram negative organisms.

ORGANISM	PREVALANCE (%)
<i>E. coli</i>	52%
<i>K. pneumoniae</i>	24%
<i>P. aeruginosa</i>	24%

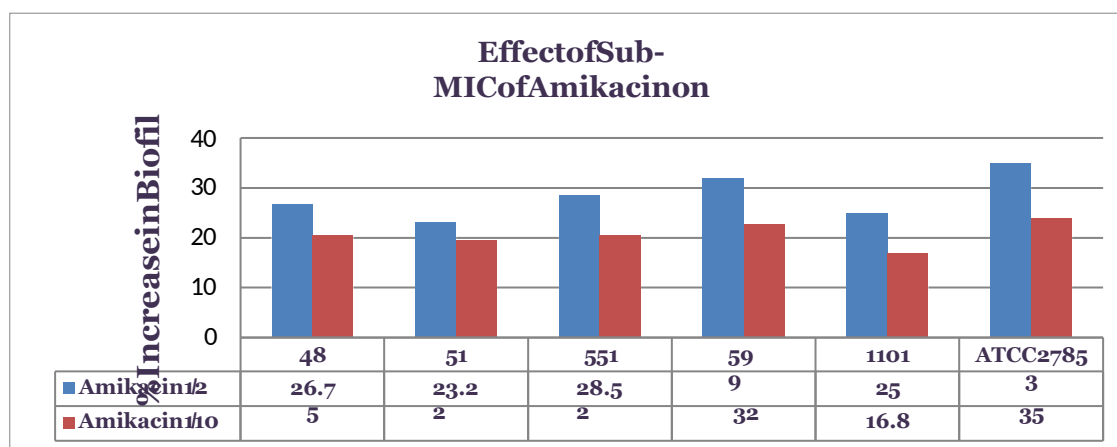
Comparative study of Isolates among ESBL producers



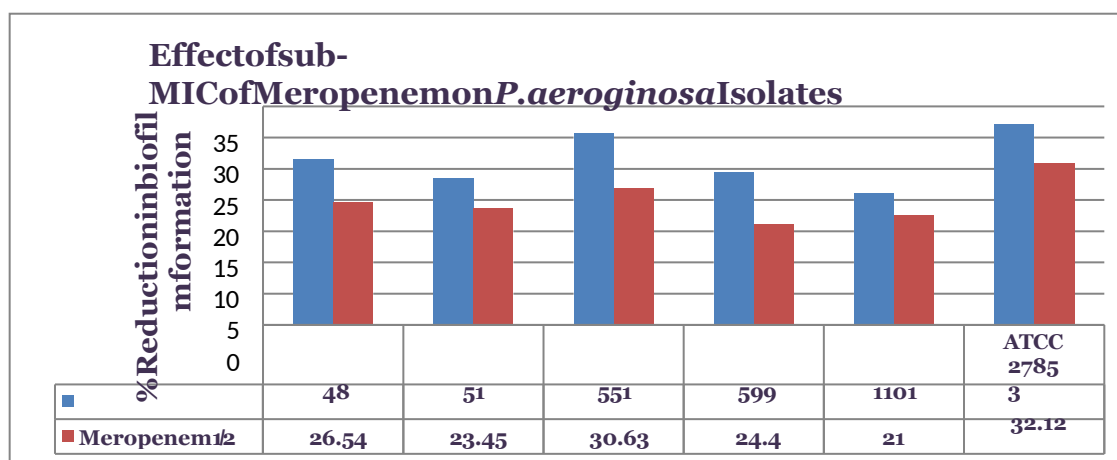
Effects of SIC of Amikacin And Meropenem on Biofilm formation by E.coli isolates



Effects of SIC on Biofilm formation by *K.pneumoniae* isolates



Effect of Sub-MIC of Amikacin on biofilm formation by *P.aeruginosa* isolates



Effect of sub-MIC of Meropenem on *P.aeruginosa* Isolates

The results showed that the inhibitory and inductive effect of the antibiotics on biofilm formation was concentration dependent. Amikacin and Meropenem effectively interfered in the biofilm formation of ESBL positive *E. coli* and *K.pneumoniae* isolates at 1/2 to 1/10th sub-MICs. In *P. aeruginosa*, Amikacin was found to induce Biofilm formation, while Meropenem reduced the biofilm formation. The present study indicates that sub-inhibitory concentrations of antibiotics

can modulate the biofilm formation and is significant as far as clinical implications due to the organisms and their treatments are considered.

5. Evaluation of anti-cancer and anti-bacterial activities of *Annona muricata* (graviola) leaves in various solvents

Investigator	Ms. Anjani Gupta
Name of college	Jhunjhunwala College
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	Dr. Usha Padmanabhan / Mr. Manoj K. Patil

Natural plant products have served as the basis of man's medicinal arsenal since time immemorial. The history of herbal medicine in the treatment of disease coincides with the history of medicine, and indeed with the history of civilization itself. Literature citations are recorded for more than 3,000 plant species that have been used or recommended in various parts of the world for the treatment of cancer. Annonaceous acetogenins are long chained fatty acid derivatives extracted from different tropical plants such as the tree *Annona muricata*, also known as Graviola. It has been recently shown that Graviola extracts exert multiple anti-cancer activities on pancreatic cancer cell models (Torres MP et al., 2012). The potential anticancer have been confirmed with mouse xenografts models, where graviola reduces both tumor growth and formation of metastasis. It was the aim of the project to study both the anti-bacterial and anticancer properties of graviola extracts.

Major breakthrough of the project

The methanolic extracts of the graviola leaves were found to have maximum cytotoxic effects towards *E. coli*, whereas both acetonic and methanolic extracts were cytotoxic to Prostate cancer cells.

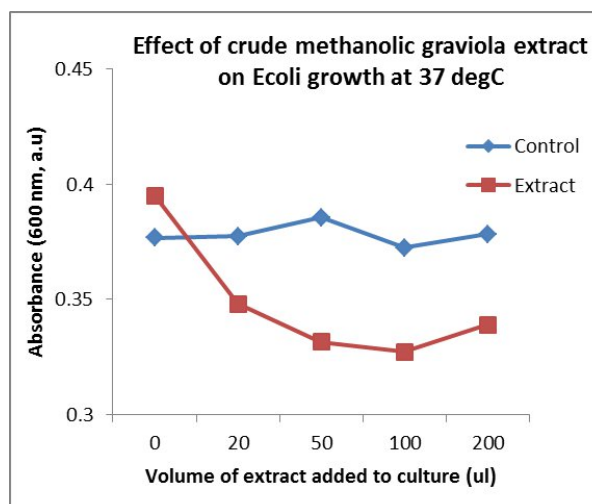
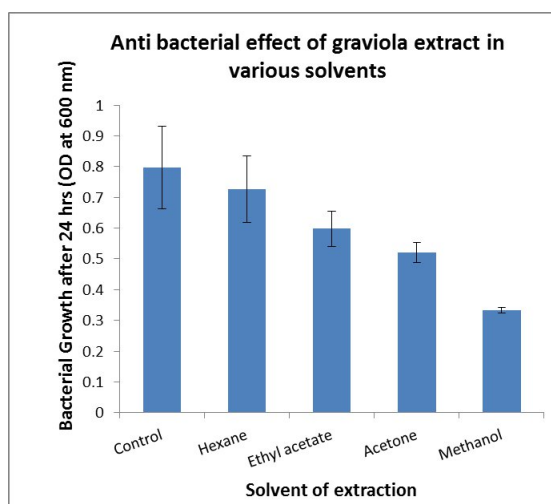


Figure 1. Antibacterial effect of graviola extracts. Left: Growth inhibition of Ecoli by graviola extracts in various solvents. Right: Dose dependent growth inhibition by methanolic extract of graviola.

In contrast both acetonic and methanolic extracts were cytotoxic to Prostate cancer (PC3) cells.

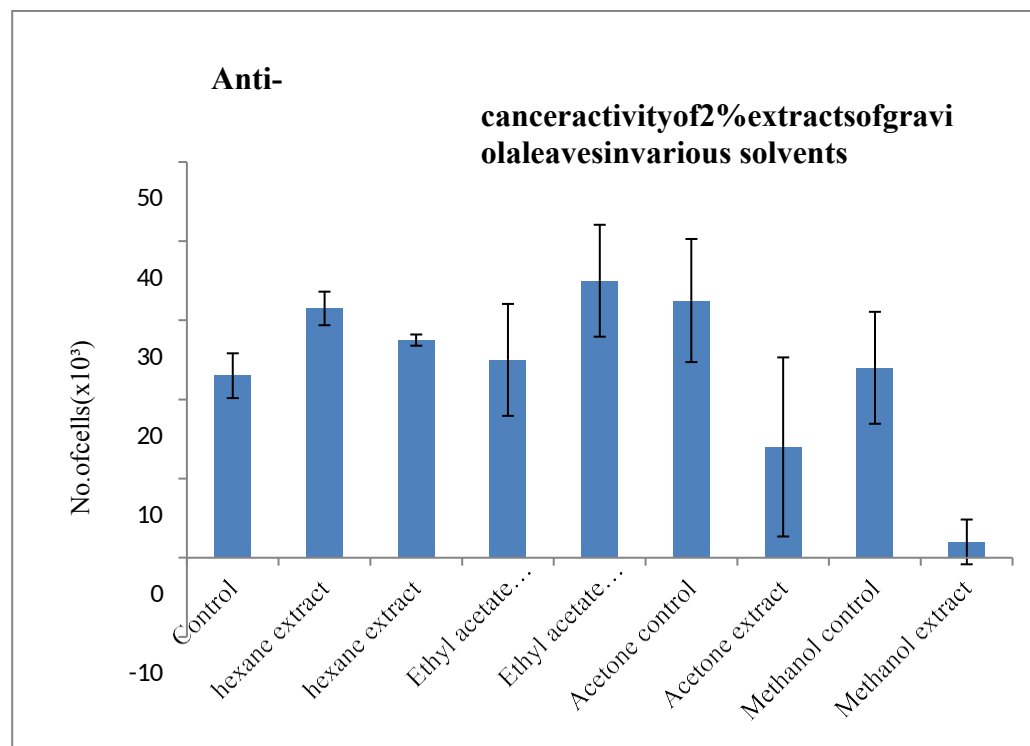


Figure 2. Activity of 2% extracts of graviola leaves in various solvents on the proliferation of PC3 cells after 48 hrs of incubation at 37°C in a humidified CO₂ incubator.

6. Synthesis and analytical evaluation of novel 4-hydroxy coumarin derivative

Investigator	Mr. Ankit Patel
Name of college	NMIMS
Guide	Dr. Anil S Bobade
Co-guide / mentor	Mr. Ashish Asrondkar

Coumarin and its derivatives have attracted immense attention in the past decades due to their undisputable importance in nature where this particular heterocycles is embedded in the large number of natural products and medicinally relevant compounds. Coumarin exhibit remarkable biological and pharmacological properties. An efficient method of preparation, mechanistic relevance and structural derivatization of 4-Hydroxy coumarin by using chloroethylacetate further treatment with hydrazine hydrate and a series of benzaldehyde was coupled and

characterization of the same is done by using FTIR, UV-spectrophotometry further purification is monitored by using HPLC, GC-MS.

7. Synthesis and analytical evaluation of novel 2-amino-6-methoxy benzothiazole derivatives

Investigator	Mr. Vishal Bhadane
Name of college	NMIMS
Guide	Dr. Anil S Bobade
Co-guide / mentor	Mr. Ashish Asrondkar

A series of 2-amino 6-methoxy benzothiazole derivatives were synthesized from different substituted phenyl isothiocyanates and tested for their anti-inflammatory activity against in-vitro HRBC membrane stabilization method. Among the synthesized compounds 3-fluorophenylisothiocyanate, tri-fluoromethylphenyl isothiocyanate, 4-chlorophenyl isothiocyanate substituted compound have showed highest anti-inflammatory activity. The potent compound 3-fluorophenylisothiocyanate, shown almost identical activity with that of reference drug. The results of in-vitro assay suggested that there is a significant anti-inflammatory activity of these compounds.

8. Synthesis of 5-Aryl-3-(5-Bromo-3-Benzofuran-2-yl)-1-Pyrazole as Antimicrobial Agent

Investigator	Mr. Shantanu Pande
Name of college	Modern College of Pharmacy
Guide	Dr. Anil S Bobade
Co-guide / mentor	Mr. Ashish Asrondkar

In this work, we evaluate the biological activities of some new derivatives of Benzofuran which can be used as effective anti-microbial agents. The recent reviews of literature have highlighted the attention of medicinal chemists because of their diverse biological activities and profound efficacy. Clinically potent benzofurans generated interest to construct a system which possesses anti-bacterial and anti-fungal activity. Furan and benzofuran are associated with wide spectrum of biological activity. In the view of these, an effort was made to check some synthesized compounds for their anti-microbial activity.

In present study, pyrazoline derivatives were synthesized; 5-bromo-3-methyl acetophenone undergoes ring formation in presence of chloroacetone to form benzofuran which further forms chalcone on treatment with substituted benzaldehyde. This intermediate on treatment with hydrazine hydrate results into pyrazoline. Further it reacts with various benzoyl chlorides to form the titled product. Synthesized compounds have been confirmed on the basis of spectral studies and analytical data. All the compounds were screened for their in-vitro anti-bacterial activity against Gram positive *Staphylococcus aureus* ATCC3750 and Gram negative *Salmonella typhi* NCTC786, anti-fungal strains of *Candida albicans* ATCC10233 and *Aspergillus niger* ATCC 16404 using tube dilution method showing moderate activity.

9. Comparative studies on Synthesis of 2-Chloro-N-(2, 5-Dihydro-1, 3, 4-Thiadiazol-2-Yl) Acetamide using Microwave irradiation and Conventional techniques and their Antioxidant activity

Investigator	Mr. Omkar Shinde
Name of college	Khalsa College
Guide	Dr. Anil S Bobade
Co-guide / mentor	Mr. Ashish Asrondkar

The advantages of Microwave irradiation technology in the field of organic chemistry have been long known as it facilitates accelerated reaction rates, higher yields with relatively less power consumption than classical techniques. The presented study compares aspects like reaction time and percentage yield of various 2-amino-1, 3, 4-thiadiazole derivatives when synthesized by both, conventional as well by microwave irradiation along with their characterization using techniques such as FTIR and HPLC. They have a very promising role in the field of medicinal chemistry owing to their anti-cancer and anti-fungal properties. The study also aims to evaluate biological activity of the compounds a simple and inexpensive technique making use of 2, 2-Diphenyl-1-picrylhydrazyl (DPPH) to establish their worth as potential anti-oxidants. Thus this combination of faster synthesis and cost effectiveness can significantly reduce the cost of production of various pharmaceutical products containing thiadiazole and/or its derivatives which are known to be clinically potent.

10. Synthesis of substituted 4-(3-chloro-2-oxo-4-phenylazetidin-1-yl)-1, 5-dimethyl-2-phenyl-1, 2-dihydro-3H-pyrazol-3-one with Green Chemistry approach

Investigator	Mr. Vibhav Valsangkar
Name of college	Khalsa College
Guide	Dr. Anil S Bobade
Co-guide / mentor	Mr. Ashish Asrondkar

The rate at which reaction proceeds and how yield does it provide, has always been a question of key importance in the field of research, carried out at both academic and industrial level. With the advent of microwave irradiation technology, it has now become possible to address this difficulty owing to its property to interact directly with molecules of reacting mixture without altering their molecular structure and thus providing a forward thrust to this whole time consuming process. The presented work compares the synthesis of derivatives of 4-aminoantipyrine with microwave irradiation and conventional method. It also addresses and attempts to find out the possession of anti-oxidant activity of the derivatives. The analysis of the synthesized derivatives was carried out using analytical techniques such as HPLC, FTIR.

11. Biological Evaluation of Different Benzothiazole Derivatives

Investigator	Miss. Priyanka Singh
Name of college	Ramniranjan Jhunjhunwala College
Guide	Dr. Anil S Bobade

Co-guide / mentor	Miss. Vrushali Patil
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The amino benzothiazole have shown antimicrobial activity against many of the microorganisms and also has the antioxidant, anti inflammatory effect. The present study was focused on evaluation of antimicrobial activity of series of some amino benzothiazole derivative. The antimicrobial effect was studied with different concentration (100 to 600 mg). In this, 200 mg concentration has shown effective antimicrobial activity other . The minimum bacterial concentration (MBC) was observed in concentration. The concentration of the bacterial cells inhibited gradually for an hour was studied by spread plate method. Further the compound has shown improved activity of anti inflammatory and anti oxidant with 2 percent with standard.

12. Coumarin Derivatives and their Possible Therapeutic Activity

Investigator	Mr. Nawzad Rustom Patel
Name of college	Institute of Science
Guide	Dr. Anil S Bobade
Co-guide / mentor	Miss. Vrushali Patil

4-Hydroxy Coumarin has been recognized as compounds of pharmacological, toxicological and pathological importance. The coumarin functionality C-O-C with carbonyl group (C=O) is the outstanding feature of these molecule and is responsible for their biological and medicinal properties. Hence derivatives of 4-hydroxy coumarin were biologically screened for their anti-inflammatory, anti oxidant, anti bacterial and cell Cytotoxicity by MTT assay.

13. Analysis of Substituted benzothiazole derivatives for potent biological activity

Investigator	Miss. Aliya Sayed
Name of college	Institute of Science
Guide	Dr. Anil S Bobade
Co-guide / mentor	Miss. Vrushali Patil

The aim of the study was to synthesize new leads with potential anti microbial, anti oxidant, anti inflammatory activities. As a part of the systematic investigation of synthesis and biological activity, some new 2-amino-6-ethoxy benzothiazole derivative were synthesized and screened for their anti-microbial anti oxidant and anti inflammatory activity. The anti-microbial evaluation of newly synthesized was carried out by using tube dilution method, anti-microbial activity results revealed that compound showed good activity against bacteria *S.aureus* The anti-oxidant activity were performed by using Radical Scavenging Method.

14. Biological evaluation of triazolo-benzothiazole derivatives

Investigator	Miss. Deepali Patel
Name of college	Institute of Science
Guide	Dr. Anil S Bobade
Co-guide / mentor	Miss. Vrushali Patil

The aim of the study was to synthesized new lead molecule having broad spectrum biologically active molecule. As part of the investigation, synthesis of benzothiazole derivatives were synthesized and screened for various biological activities such as anti-microbial, anti-oxidant, anti-inflammatory activities. The antimicrobial evaluation of newly lead molecule was carried out by tube dilution method. Anti-microbial activity result revealed that compound showed good activity against bacteria *S. aureus*. The anti-oxidant activity was performed by radical scavenging method.

15. Evaluation of 2-amino-6-methoxy benzothiazole by various biological assays

Investigator	Miss. Ketki Gupta
Name of college	R D National college
Guide	Dr. Anil S Bobade
Co-guide / mentor	Miss. Vrushali Patil

A Derivative of Mercapto benzothiazole was synthesized by using substituted benzoyl chloride , the synthesized complexes have been characterized by melting point, running TLC for single spot, elemental analysis by FT-IR, UV-spectrophotometer, the resultant compound were screened for anti-inflammatory activity by using HRBC membrane stabilization. The activity increased in the form of Optical Density, among the substituent's fluoro derivative was found to be most active.

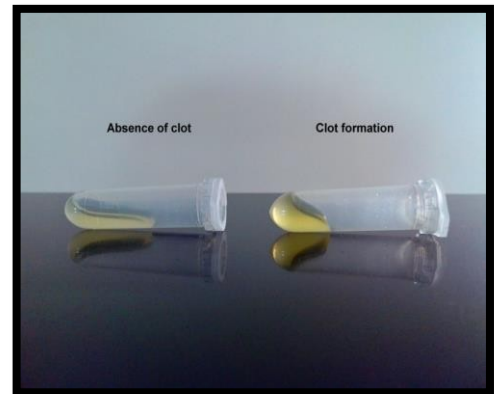
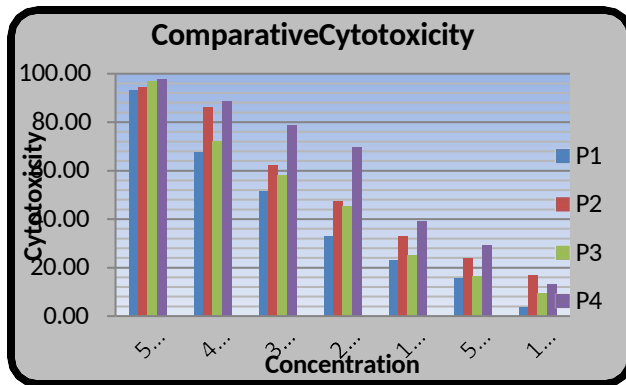
16. Study of Neutralization of Enzymatic Activity of *Daboia Russelii* Venom by Various Plant Extracts and Their Combinations using *in vitro* Method

Investigator	Ms. Tejashree Vijay More
Name of college	D.Y. Patil College , Navi Mumbai
Guide	Dr. Abhay Chowdhary
Co-guide / mentor	Dr. Mrunal Ghag Sawant / Mr. Lalit Samant

Snakebite is an important cause of morbidity and mortality and is one of the major health problems in India. Russell's viper (*Daboia russelli*) appears to be the commonest cause of fatal snakebite in many Asian countries and especially in the Indian subcontinent. Plant extracts with a range of antiophidian activities constitute an excellent alternative. In this study we investigated the anti venom potential of methanolic extracts of *Pongamia pinnata*, *Piper longum*, *Sapindus laurifolius* and *Adhatoda zeylanica* by *in vitro* methods. The plant extracts were tested for their activity on various pharmacological effects like procoagulant activity, proteolytic activity and phospholipase A2 activity of Russell's viper venom and these activities were effectively neutralized by all the four plant extracts in dose dependent manner. The study also attempted to prove the effectiveness of using combinations of crude plant extracts, the area not yet extensively ventured by researchers but is a common practice of ayurvedic medicine. The results obtained from the *in vitro* assays indicates that the four plant extracts possess potent snake venom neutralizing compounds, which inhibit the activity of *Daboia russelii* venom. All the recorded data was subjected to statistical evaluation to check the significance of the observations. *In vivo* neutralization assays have to be carried out to confirm the results of this preliminary study. Further investigations are needed for identification and purification of active components involved in neutralization of snake venom. There are still a number of drugs and combinations of drugs which are mentioned in ayurvedic text to have anti-venomous properties. The drugs need to be identified and research work should be done on each plant and combinations also so that the most effective alternative drug for anti-snake venom will be put forward.

Major Breakthrough Of The Project

The further scope for investigations of the presented work includes testing the anti venom potential of extracts of *Pongamia pinnata*, *Piper longum*, *Sapindus laurifolius* and *Adhatoda zeylannica* by *in vivo* methods. It is noteworthy that the *in vitro* studies were performed using the crude extracts of these plants and thus an increase in the extent of activity can be expected with the use of highly purified extracts or isolated constituents.



Procoagulant activity

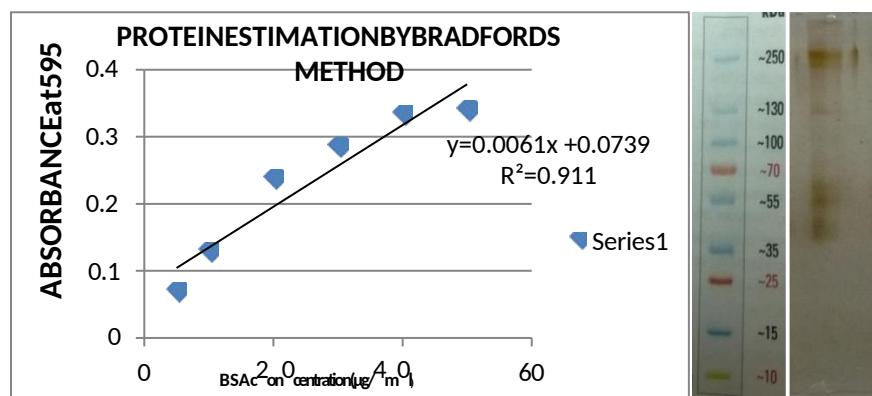
17. *In vitro* Biochemical Characterization of Saw Scale Viper Snake Venom

Investigator	Ms. Vaishnavi Raman
Name of college	Ruia College, Matunga
Guide	Dr. Abhay Chowdhary
Co-guide / mentor	Dr. Mrunal Ghag Sawant / Mr. lalit Samant

Snake venoms consist of a complex mixture of toxic components that are used by a various type of animal species for defence and predation. Envenomation of mammalian species leads to an acute inflammatory response and can lead to the development of IgE-dependent venom allergy. Snake venom have been used to treat various pathophysiological disease. There is decrease in erythrocyte sedimentation rate and DNA damage during certain disease like cancer. Snake venom have been found to cause 95% DNA damage, thus increasing chances of hereditary disorders after snake bite. The cascade on which the venom component act during clotting has been found to show similarity to the blood clots formed. The venom have been found to act on transcription receptor Nuclear Factor kappa light chain enhancers of activated B-cells (NFkB) and AP-1. The activation on NFkB has shown to act on protein kinase C forming a complex. This complex has been shown to act on cholinergic receptor increase in level of IL-6, IL-2, IL-12 and NFkB signaling. Venom generally contains PLA2 enzyme which have been found to have antibacterial activity. Fractionation of venom is being carried out to check the presence of certain component. MTT is carried out check the level of toxicity. The experiment is being carried out to check whether the venom can act as treatment at preliminary stage of certain disease and also to determine biochemical characteristic such as clotting time, Proteolytic cleavage, HPLC, molecular weight of protein present, antibacterial activity.

Major Breakthrough of The Project

Saw scaled viper venom when tested have activity of enzyme protease but to lower extent preventing membrane damage. These specific protein need to be targeted during antivenom production. Using procoagulant activity the possible cascade on which venom act can be devised to prevent effect of venom on blood brain barrier. But the protein concentration of venom have been found to be quite low hence further investigation need to be carried out to check whether the characteristic shown are due to low protein concentration or are actual characteristic of venom.



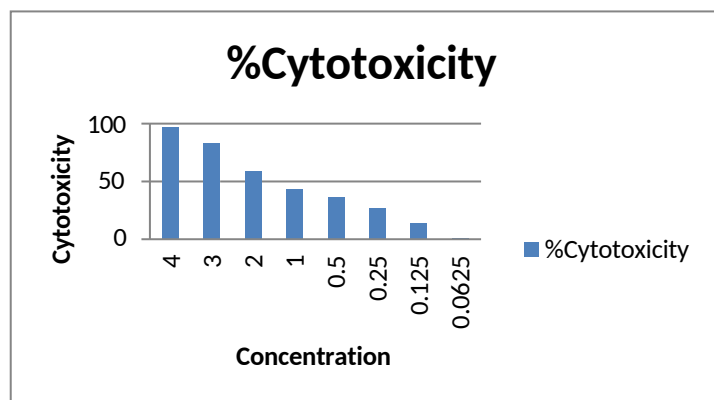
18. *In vitro* Biochemical Characterization and Anticancer Property of Common Krait Snake Venom

Investigator	Ms. Dipti Thathavarthy
Name of college	Ramniranjan Jhunjhunvala of Arts, Science and Commerce
Guide	Dr. Abhay Chowdhary
Co-guide / mentor	Dr. Mrunal Ghag Sawant & Dr. Rahul Deshmukh /Mr. Nakul Shah

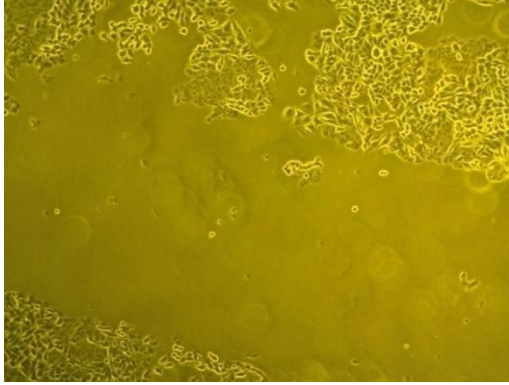
The biodiversity of venoms and toxins makes them a unique source from which novel therapeutics may be developed. The anticancer effect of cytokine 1 from naja atra cantor venom was studied and it was found to be effective against cancer cells [4, 7, 20]. Snake venom has different enzymes, toxins, proteins and many of the enzymes are commonly found in all the snakes for example peptidase, phosphodiesterase, hyaluronidase etc. Along with these enzymes Common Krait specifically shows the presence of phospholipases, Lactate dehydrogenase, Lysophospholipase, Acetylcholinesterase, Cysteine rich secretory proteins (CRISPs) enzymes [9, 14]. Out of these the highly prominent enzymes responsible for toxicity was found to be hyaluronidases and phospholipases. Biochemical characterizations of different snakes like Indian cobra, Russell's viper is well studied [8, 18]. But biochemical characteristics of Common Krait are not much known. The main objective of this project is to study the biochemical characteristics and anti cancerous property of snake venom on cancerous cell line.

Major breakthrough of the projects

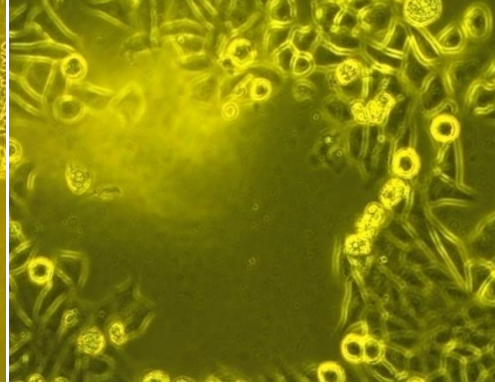
From all the assays used for determining anti-cancerous property it was found that venom at a concentration of 1 µg/ml is toxic to cancerous cells and least toxic to normal cells and the venom was targeting nucleic acids. Thus in future if the protein in venom showing anti-cancerous property is identified then it can be designed invitro by knowing its structure and properties using bioinformatics and can be used as a anti-cancerous drug and there would be no need of venom extraction.



Cell Migration assay on MCF 7 cells with venom



Day 0 MCF 7 cell monolayer
with venom



After 15 hours of incubation
with venom

19. Comparative evaluation of the Anti-Inflammatory activity of Plant Extracts, Organic compounds and their combinations

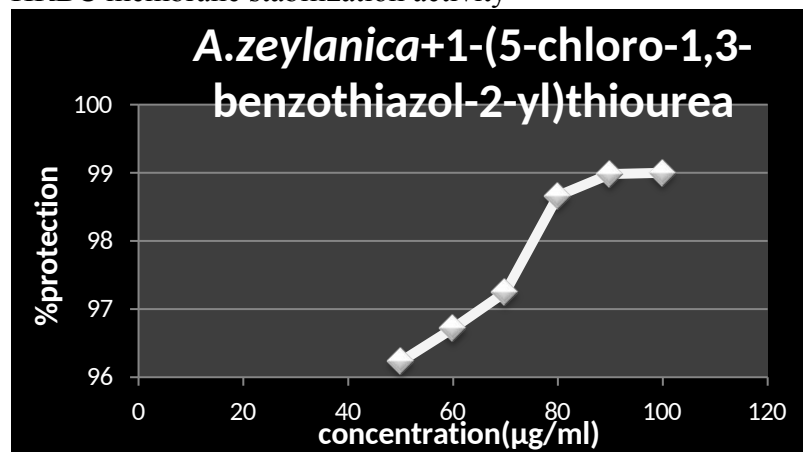
Investigator	Ms. Anjali Jayamohan Narayakkadan
Name of college	Dr. D. Y. Patil.
Guide	Dr. Abhay Chowdhary
Co-guide / mentor	Dr. Mrunal Ghag Sawant and Mr. Ashish Asrondkar

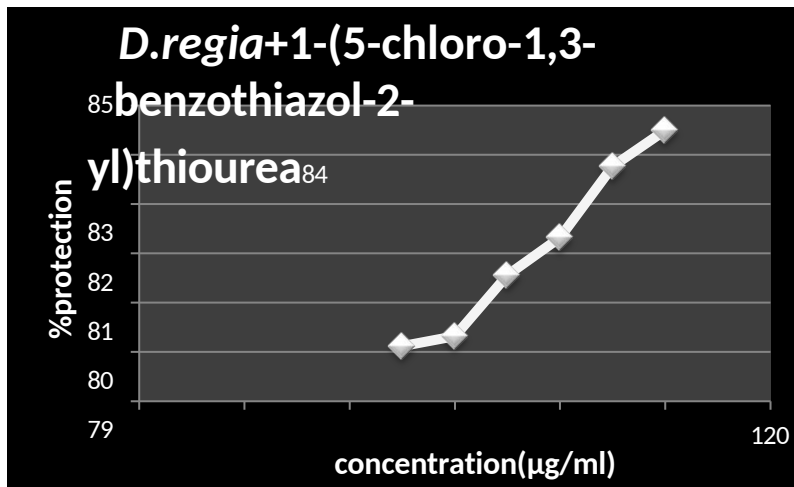
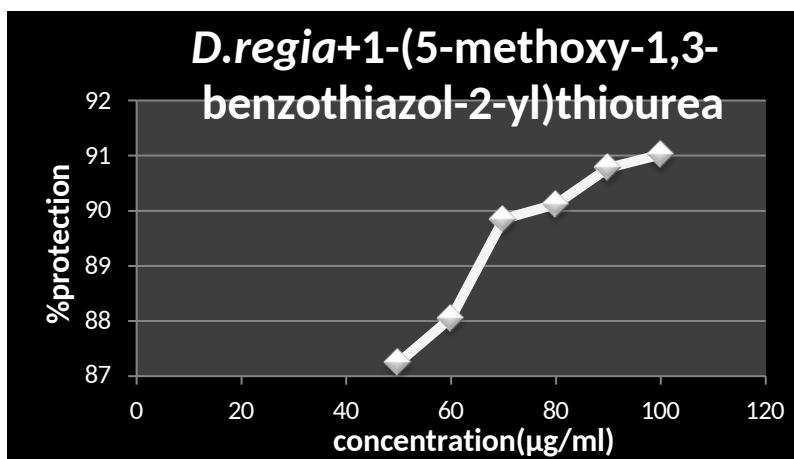
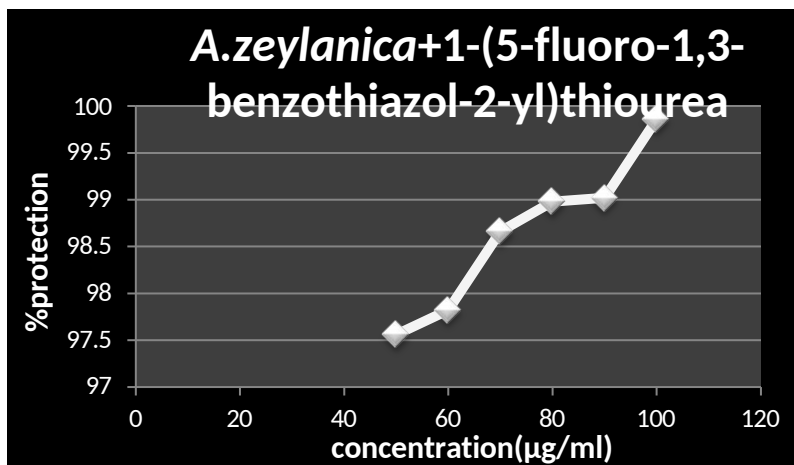
Inflammation plays an important role in various diseases with high prevalence within population such as rheumatoid arthritis, atherosclerosis and asthma. Here we demonstrate the invitro anti-inflammatory activity plant extract (*Pongamia pinnata*, *Syzigium cumini*, *Delonix regia*, *Adathoda zeylanica*), organic compounds [1-(5-fluorohydroxy-1,3-benzothiazol-2-yl)thiourea and 1-(5-methoxy-1,3-benzothiazol-2-yl)thiourea] and the combination of the plants with the organic compounds. They were also evaluated for anti-oxidant activity and checked for their Cytotoxicity. The methanol extract after preliminary Phytochemical investigation showed the presence of Phenolic compound, Terpenoids, Flavonoids, Tannis in all the extracts. Alkoids were found only in *S.cumini*. The combination of *S.cumini* with 1-(5-methoxy-1,3-benzothiazol-2-yl)thiourea was the most anti-oxidant with an IC₅₀ of 58 ug/ml which was even superior to the standard BHT. The plants and organic compounds showed significant anti-inflammatory effect with most of the samples showing over 90% percent protection although the combinations did not serve to bring about any increase in the anti-inflammatory activity as compared to individual activity. Our finding indicates that the plants and organic compound have effect in curbing the inflammatory response.

Major breakthrough of the project

The study has thus provided some insight into combining potential drug components being a possible way to increase the activity as compared to the individual. Further detailed investigation is necessary to determine the exact constituents and pathway that are responsible for the activities. These can have a potential benefit in the management of inflammatory disorders.

HRBC membrane stabilization activity





20. DNA Methylation and DNA Hydroxymethylation Dynamics during Mammalian Preimplantation Embryonic Development

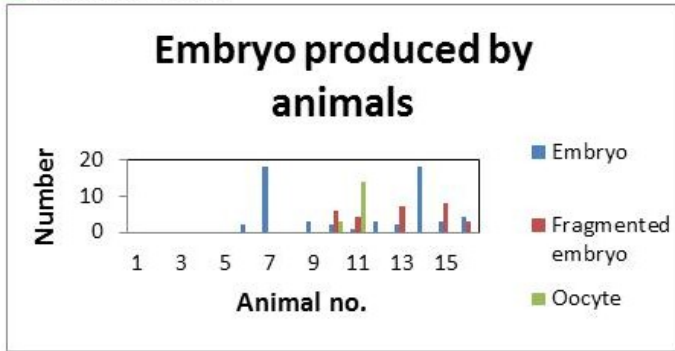
Investigator	
Name of college	Narsee Monjee Institute of Management Studies (NMIMS)
Guide	Dr. Abhay Chowdhary
Co-guide / mentor	Dr. Rahul Deshmukh/Dr. Veeranjanyulu Addepalli

The mouse shares a similarity with human in pathological and genetic make-up and serves as small laboratory animal for genetic study. In current scenario with increasing infertility aboom in ART is seen. A gene specific study by functional mapping, PCR of 5-MeC and 5hMeC in bovine embryonic development has been published recently by Montera et al, 2013 which is giving scope to include such technique. A report on epigenetic reprogramming playing role in preimplantation embryonic development (Ma et al, 2012) suggests the need to study this epigenetic modification and generate a library. The present project work is proposed to develop a basic method to study global DNA methylation and DNA hydroxymethylation dynamics in mouse embryo by immunocytochemistry.

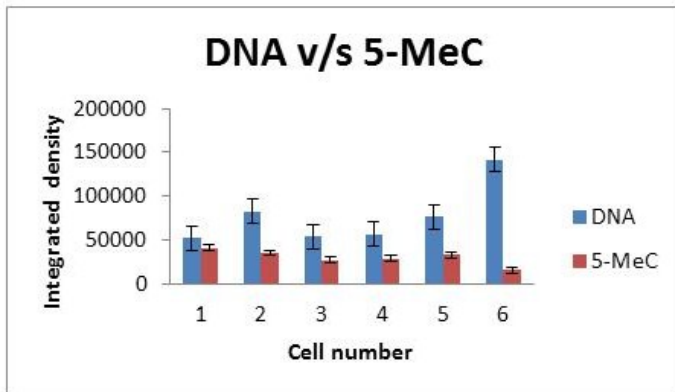
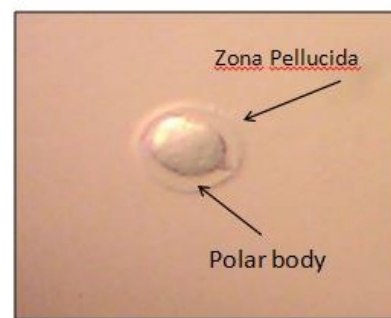
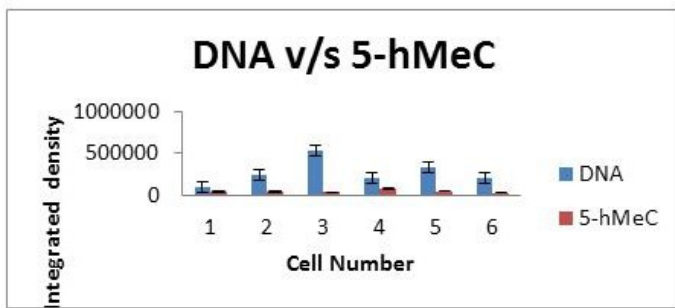
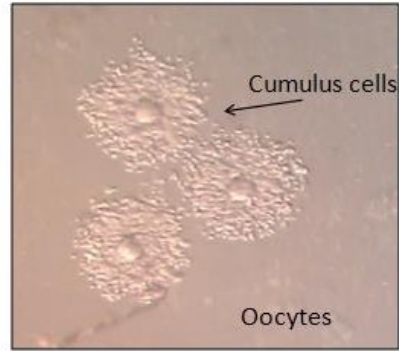
Major breakthrough of the project

A future perspective of this research projected hints towards a comparative study between natural mated and superovulated embryo for evaluation of the quality of embryo. A more Specific mode of detection of fertilization is needed other than observation of vaginal plug in order to collect embryo of exact stage. Standardisation of immunocytochemistry protocol with lower concentration of HCl i.e. 0.1 – 0.5 N may be taken into consideration for successfully staining while DNA denaturation step.

Graphical representation of integrated density of DNA and 5-hMeC



One cell Stage of Embryo



21. To Study the Antibiotic susceptibility, biofilm formation, heavy-metal resistance and Plasmid profiling in *E. coli* and *Klebsiella Spp.* isolated from different drinking water sources

Investigator	Mr. Hardik Ramani
Name of college	
Guide	Dr. Abhay Chowdhary
Co-guide / mentor	Mr. Rohan Dudhale/Mr. Vivek Vishwe

Contaminated drinking water has always been an important agent in the spread of disease. Ingestion may cause gastrointestinal diseases. Water treatment and disinfection has markedly reduced the incidence of many diseases, but the need for constant vigilance and enforcement of standards is highlighted by the occasional water-borne disease epidemic. Organisms which are pathogenic to humans are rarely capable of survival as free-living organisms for very long. Virtually all the water-borne diseases affecting humans are a result of poor waste treatment and disposal practices; the disposal of disease organisms carrying resistance to antibiotic drugs is of particular concern. In water *E.coli* and *Klebsiella spp.* are normally found and it act as indicators hence, in our present study we can carry out MPN test to estimate the bio burden in drinking water samples and isolating these microorganisms to check the antibiotic susceptibility and heavy-metal tolerance. We also focus on their rate of biofilm formation. This study will focus on the important human pathogenic bacteria. They can be carrying out the resistance gene from water. The ability to form biofilm formation in these pathogenic bacteria tends towards antibiotic resistance and heavy metal tolerance.

In this study we collected the almost 50 water samples in an around Mumbai public drinking water sources. MPN method we found the most bio-burden in these water samples, especially in water *E.coli* and *Klebsiella spp.* are normally found but we also find out there antibiotic resistance pattern, heavy metal tolerance, capability to form biofilm and study the plasmid profiling of these bacteria.

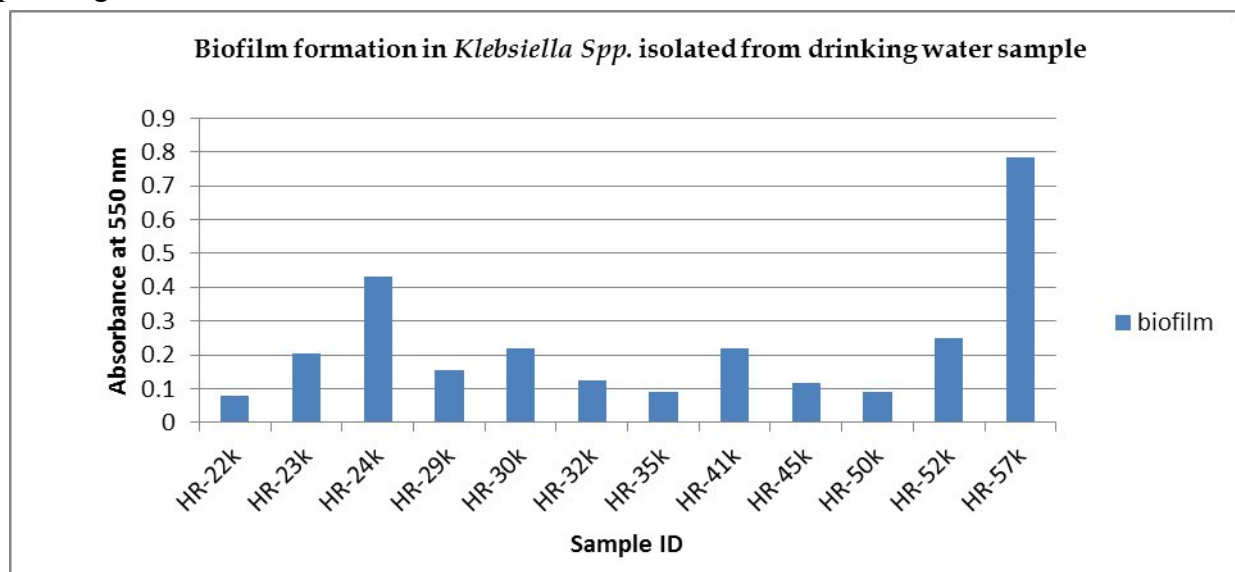


Figure1: Graphical representation of quantification of biofilm formation assay of *Klebsiella spp.*

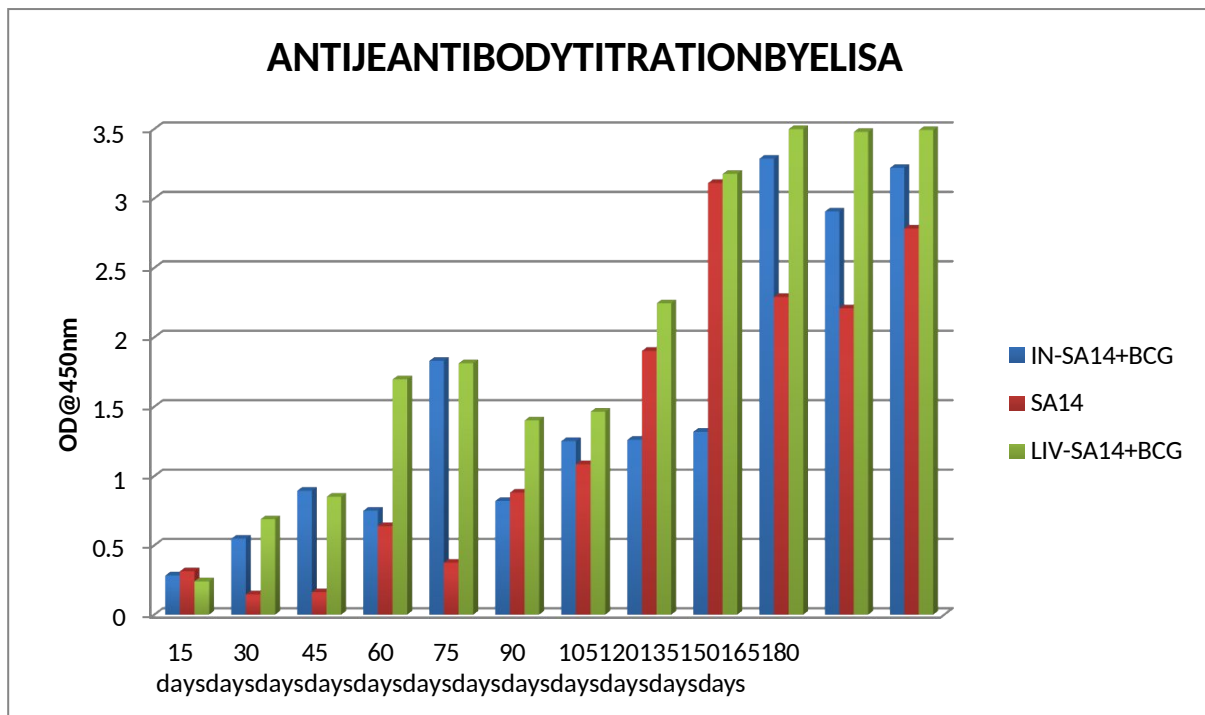


Figure 2: Plasmid Profiling of *Klebsiella* spp. Isolated from drinking water sample.

22. Immunological studies of BCG as an adjuvant on Japanese Encephalitis Virus vaccine

Investigator	Mahwish Khan
Name of college	Dr. D.Y Patil College of biotechnology, Belapur, Navi Mumbai
Guide	Dr. Abhay Chowdhary/Dr. Mira Ramaiya
Co-guide / mentor	Mr. Sahil Kulkarni

Japanese Encephalitis (JE) is a vector borne viral disease which is a leading cause of Acute Encephalitis syndrome (AES) and other neurological impairment in the tropics. It mainly affects children <15 years of age. JE vaccines with measurable success are inactivated mouse brain-derived vaccine (JE-VAX), inactivated Vero cell culture-derived vaccine (IXIARO) and SA-14-14-2 live attenuated JE vaccine. These require multiple booster doses to be administered and there are several other concerns with the use of these vaccines. The aim of our study is to evaluate the efficacy of SA-14-14-2 virus vaccine using BCG as an adjuvant in order to provide a better immune response. BCG a known immunomodulator, is a potent adjuvant as a single inoculate can elicit long-term immunity. The study was performed on suckling BALB/c mice divided in five groups viz. Vaccine diluent control, Inactivated SA-14-14-2 with BCG, SA-14-14-2, SA-14-14-2 with BCG and BCG vaccine control. Serum was separated and anti JEV antibody titre was determined. IgG1 Indirect ELISA performed on serum samples exhibited presence of JE specific antibody levels from 30 days p.i with the highest levels in Group with live SA-14-14-2 with BCG group followed by Inactivated SA-14-14-2 with BCG and then our control SA-14-14-2. Thus preliminary results indicate at enhanced JE specific antibody titres in groups with BCG as adjuvant. However neutralization and challenge studies will be needed to substantiate the results



TIME OF BLEEDING	OD @ 450 nm		
	IN-SA14+BCG	SA14	LIV-SA14+BCG
15 days	0.2835*	0.3137	0.2408*
30 days	0.5494*	0.1471	0.6895*
45 days	0.8951*	0.1633	0.8519*
60 days	0.7509*	0.6392	1.6978*
75 days	1.8305*	0.3752	1.8132*
90 days	0.8208*	0.8812	1.4026*
105 days	1.2527*	1.0859	1.4648*
120 days	1.2625*	1.9025	2.2456*
135 days	1.3194*	3.1115	3.1773*
150 days	3.2868*	2.291	3.5*
165 days	2.9067*	2.2087	3.4799*
180 days	3.2202*	2.7839	3.4934*

Antibody Titration of Anti JE antibodies by ELISA. * $p < 0.0001$
p values were calculated using ANOVA on Graph Pad Prism, using SA14 as the Control group

23. Cloning of Japanese encephalitis virus Domain III

Investigator	Ms. Kaushiki prabhudesai
Name of college	Vaze kelkar college Mulund.Mumbai
Guide	Dr. Abhay Chowdhary /Dr. Mira Ramaiya
Co-guide / mentor	Mr. Sahil Kulkarni

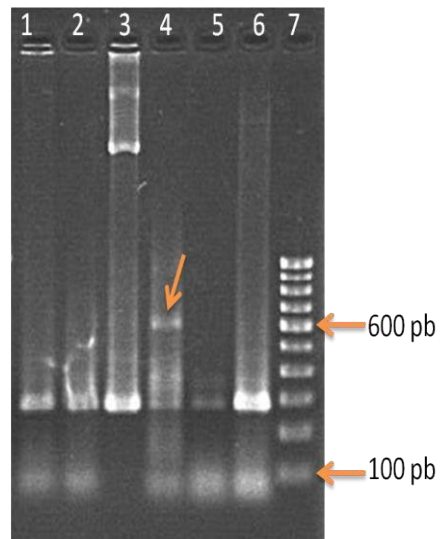
The immunodominant region of the Japanese Encephalitis virus was identified. Once done so, primers for the same were designed.

The Bacterial Expression Vector pJET was chosen so as to perform the required cloning techniques using suitable kit based procedures. The immunodominant region of the virus namely Domain 3 was then cloned into the pJET vector using Blunt End Cloning technique.

This was then transformed into suitable media plates containing the appropriate antibiotic. The antibiotic was chosen depending on the antibody resistant site in the vector, in this case, being Ampicillin. Hence, transformation was done on LB plates containing the antibody Ampicillin.



Colony PCR



Colony PCR for JEV domain III cloning in pVAC

24. Assessment of metallothionin iso forms in experimental Malaria model

Investigator	Ms.Pooja Das
Name of college	Dr. D.Y Patil College of biotechnology, Belapur, Navi Mumbai
Guide	Dr. Abhay Chowdhary/Dr. Mira Ramaiya
Co-guide / mentor	Ms. Mansi Malik

Malaria is the major killer claiming millions of lives worldwide. Malaria is caused by plasmodium *sp.* All species requiring a vertebrate and invertebrate host. In malaria infection there is a significant metabolic interaction between as the parasite diverts nutrients towards its own growth. Oxidative stress is the major pathology attributed by the parasite in malaria. Increased ROS and RNS are the major reasons for the resulting pathophysiology of the disease. The presence of high levels of oxidative stress is reported to result in the differential expression of antioxidant genes. Transition metals have a very imp role to play In oxidative stress damage and the disease pathology. The up-regulation of many proteins like MT"s, ferritins, heat shock proteins protects against oxidative stress injury.mt is a collective name for a superfamily of ubiquitous expressed low mol weight proteins with high sulphur contents and a high metal binding capacity.mt are induced and are reported to harbor antioxidant functions.mtb protein provide cysteine thiolate ligands for metal and constitute for part of the metal buffer in size, both for storing biologically important metals and for sequestering toxic ones. This study aims at studying the gene expression profile of mt isoforms I, II and III in severely parasitized mice. The mice were inoculated with a lethal strain *Plasmodium berghei ANKA*. The tissues namely liver,spleen and brain were harvested and processed. The tissues were divided into two parts for processing, one for homogenization and the other for RNA extraction. Also the gene expression of a major iron binding protein transferrin,copper binding protein ceruloplasmin and a selenium binding protein glutathione peroxidase 1 were studied along with mt isoforms using real time reverse transcriptase pcr.The protein quantification of transferrin was carried out using mouse transferrin ELISA kit(my biosource,USA).The upregulation and down regulation of the metal sequestering genes was calculated and analyzed using delta-delta ct method of relative quantification of gene expression.

GENE	LIVER	SPLEEN	BRAIN
METALLOTHIONEIN I	4	32	0.015625
METALLOTHIONEIN II	1	2	0.03125
METALLOTHIONEIN III	-	-	1
TRANSFERRIN	2	4	0.5
GLUTATHIONE PEROXIDASE I	59.71411	2	0.5
CERULOPLASMIN	32	2.0557	0.038473263

INSTITUTIONAL/EXTERNALLY FUNDED PROJECTS :

1. Seroprevalence of Measles, Mumps And Rubella In Adolescents In Mumbai – India

Investigator	Devanshi J. Gohil
Co-Investigators	Dr. Sweta T Kothari
Funding agency	Serum Institute of India Research Foundation, Pune

Measles, Mumps and Rubella (MMR) are vaccine preventable viral infectious diseases which cause a significant mortality and morbidity to the global population. Increased incidence rates of these infectious diseases are observed in young adolescents. Information on seroprevalence data on MMR in India is limited with no serological evaluation studies from Mumbai. The objective of this study was to determine the prevalence of IgG antibodies against MMR among young adolescents. This was a prospective study involving 192 healthy adolescents from Maharshi Dayanand College, Mumbai. Blood samples were collected from individuals of 18-23 years of age between December 2012 and September 2013. The quantitative determination of IgG antibodies in serum specimens against MMR were determined using enzyme linked immunosorbent assay. Data on history of vaccination was collected from participants. The MMR vaccination status of 96% of participants was not known and 2% were unvaccinated. The important cause associated with seronegativity to measles, mumps and rubella is the missing MMR vaccination. The female population in present belongs to reproductive age group. Expecting mothers may have their offspring at risk of the congenital rubella syndrome in absence of rubella antibody. Thus, a booster dose of MR vaccine should be provided for long term protection against measles and rubella.

Major Breakthrough Of The Project

- Among 192 healthy adolescents, measles, mumps, and rubella seroprevalence were 91%, 97%, and 88%, respectively.
 - The overall seropositivity of MMR was 79%. The highest level of seronegativity was seen with regards to rubella specific antibodies with 12% of cases.
-

2. Single nucleotide polymorphisms in PPAR γ 2 and TCF7L2 genes implicated in type 2 diabetes

Investigator	Dr. Rosalind Marita
Co-investigators	Ms. Suparna Deepak
Funding agency	Haffkine Institute

The risk of developing type 2 diabetes is determined by both genetic and environmental factors. Peroxisome proliferator-activated receptor γ 2 (PPAR γ 2) is a nuclear receptor that plays a central role in carbohydrate and lipid metabolism. A polymorphism (Pro12Ala) in the PPAR γ 2 gene has been associated with diabetes. Transcription factor-7-like 2 (TCF7L2) is involved in the regulation of pancreatic function through insulin secretion. A polymorphism in the TCF7L2 gene (C/T) has also been studied as a susceptibility marker. To understand the genetic susceptibility to type 2 diabetes we evaluated single nucleotide polymorphisms (SNPs) in these two genes. Blood from 131 subjects from western India was subjected to SNP analysis by RFLP-PCR.

Biochemical parameters including lipid profile were determined. In this cohort, the most common genotype in PPAR γ 2 was 'Pro/Pro' which had a frequency of 83.2%. The genotypic frequencies of 'Pro/Ala' and 'Ala/Ala' were 14.5% and 2.3%, respectively. Incident cases of Type 2 diabetes were found in subjects with 'Pro/Pro' genotype. Subjects with Ala/Ala and Pro/Ala genotypes were free from diabetes at the time of evaluation. In the case of TCF7L2 gene, the most prevalent genotype was C/T that exhibited a frequency of 53.4%. The genotypic frequencies of T/T and C/C were 35.9% and 10.7%, respectively. The C/C homozygotes showed a higher incidence of diabetes compared to C/T heterozygotes (21.4% vs 2.8%). Further, homozygosity for the 'C' allele was significantly ($p = 0.02$) associated with serum total cholesterol and triglyceride levels. In this small cohort, the Pro12Ala polymorphism in PPAR γ 2 gene did not have significant discriminating potential while C/T polymorphism in TCF7L2 gene identified subjects with higher susceptibility to diabetes. In addition, C/T polymorphism in TCF7L2 gene is also predictive of serum cholesterol and triglyceride levels, well-known cardiovascular risk factors.

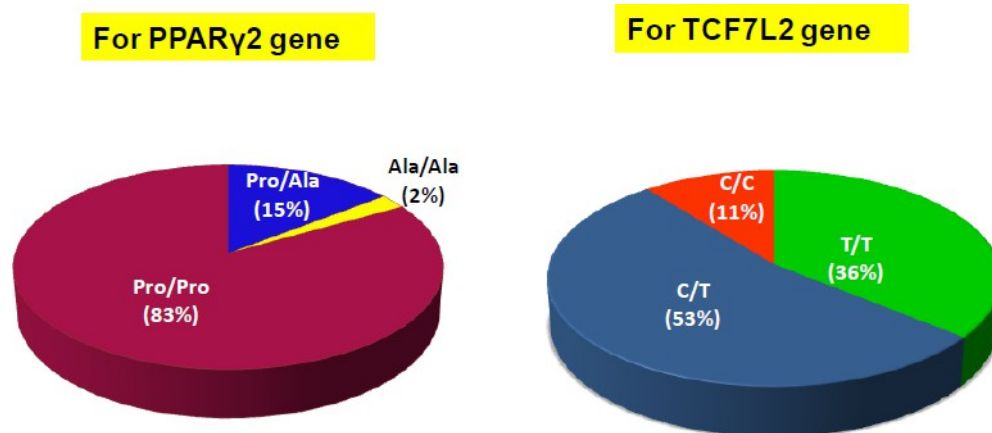
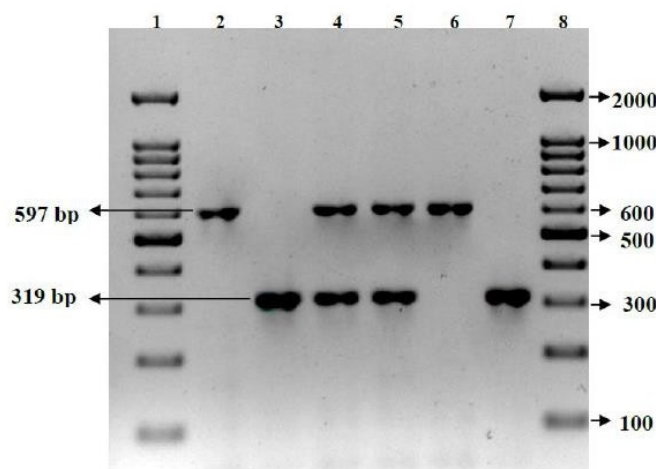


Figure 1: Pie Chart analyses of the genotypes (polymorphisms) present in PPAR γ -2 and TCF7L2 genes in a working population

3. Analysis of Angiotensin Converting Enzyme (ACE) polymorphism in sample of a worksite population

Investigator	Dr. Rosalind Marita
Co-Investigators	Dr. Sweta T Kothari
Funding agency	Haffkine Institute

Angiotensin converting enzyme (ACE) is an important enzyme involved in the regulation of blood pressure in humans. A polymorphism involving the presence (insertion, I) or absence (deletion, D) of a 287-bp Alu sequence of DNA in intron 16 of the gene has been detected which relates to activity of ACE. This project aims to investigate I/D polymorphism in the Angiotensin Converting Enzyme, ACE Gene in the Indian population. The effect of this polymorphism has been studied on disorders like hypertension heart disease and diabetes but with varying results. Most of these studies were case control studies carried out in a hospital setup. This is one of the first studies to be carried out on a cohort of asymptomatic Indian population. Investigation of the ACE (I/D) polymorphism and its correlation with biochemical risk factors and other vital parameters in the normal population can lay foundation to understand the implication of ACE in the risk assessment of population.



D/D = 319 bp: I/I = 597 bp I/D = 319, 597 bp

We found a significant number of the study population (33%) having the genotype D/D which is a novel finding in comparison to previous studies involving I/D polymorphism. Its biochemical implications are currently under investigation

4. Statistical analyses of kidney stone

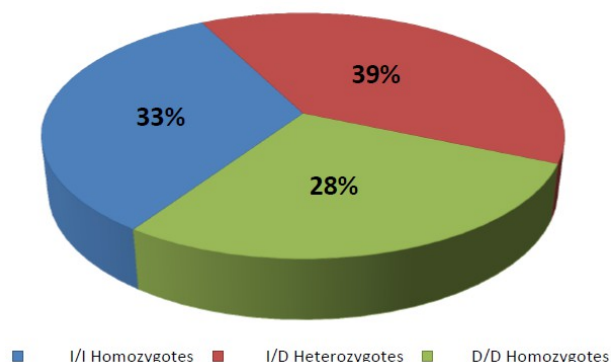
Investigator	Dr. Usha Padmanabhan
Co-Investigators	Dr. Abhay Chowdhary
Funding agency	Haffkine Institute

composition in an Indian population

Figure 1: DNA Gel electrophoresis of ACE gene polymorphisms (insertions and deletions) to differentiate between two genotypes within the working population. Primers designed against intron 16 of ACE gene yield either a 597 bp or a 319 bp PCR product which represents an insertion or deletion of 296 bp in that region, respectively.

Figure 2: Pie chart representing the distribution of ACE polymorphisms within the studied population

Distribution of ACE I/D polymorphism in study population



Abstract

Renal calculi (or kidney stones) post-surgical intervention from the various hospitals in the Mumbai region were analyzed for the presence biochemical components such as calcium, magnesium, oxalate, urate, xanthine, ammonium and phosphate at our Department. In this study, we retrospectively analyzed 176 kidney stone samples which were characterized biochemically during period 2008-2012 to evaluate the predominant component and to establish any correlation which may exist between the biochemical components in these samples and the diet of these patients.

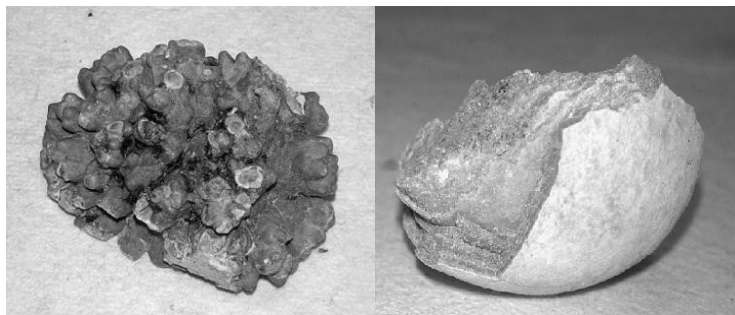


Figure 1: Examples of Stones presented to our department for analysis.

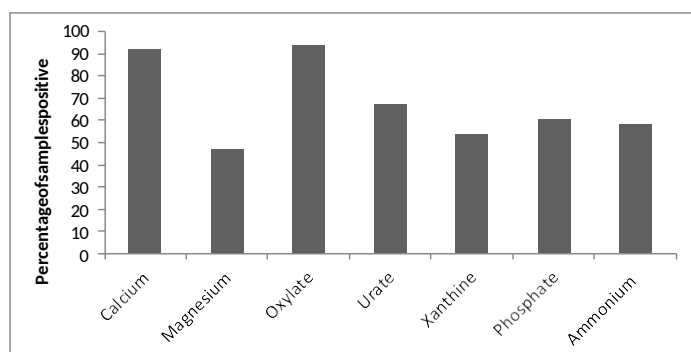


Figure 2: Biochemical analyses of kidney stones. Y axis depicts the percentage of samples which were positive for a particular component. Percentages were calculated using the ratio of the number of positive samples to the total number of samples.

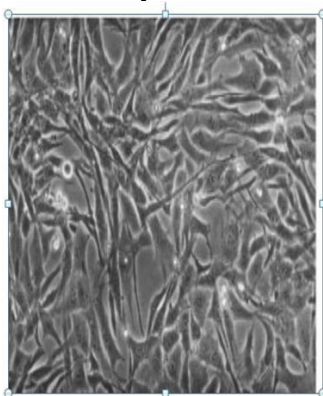
2-proportion z-test was applied to determine the significance of the presence of different biochemical components in the kidney stones from males and females, strictly non-vegetarians and moderate non-vegetarians. A non-vegetarian diet increases the presence of uric acid and xanthine presence in renal calculi due to the heavy ketogenic diet. On the other hand, ammonium presence in non-vegetarians on a ketogenic diet and in moderate non-vegetarians was similar, implying that in moderate non-vegetarians, genetic factors may have predisposed formation of calculi. (Manuscript submitted: Shirsat P, Patil S, et al. 2014)

5. Screening of Japanese encephalitis virus in culex spp in and around Mumbai

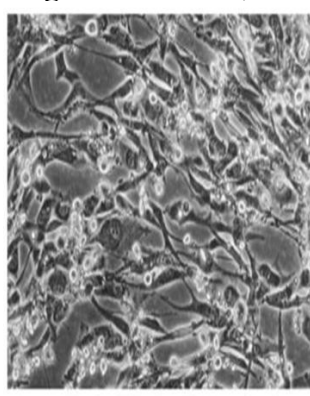
Investigator	Mr. Sahil Kulkarni
Co-Investigators	Dr. Abhay Chowdhary/ Dr. Mira Ramaiya
Funding agency	Haffkine Institute

Japanese Encephalitis (JE) is an important mosquito-borne viral disease and one of the leading causes of viral encephalitis and neurological infections in Asia. Although severely under-reported, 50,000 cases are annually recorded throughout Asia, with 15,000 deaths (5-35% CaseFatality Rate) and a 75% JE-related disability rate (767,000 DALYs, WHO, 2002). In Mumbai there have been a few isolated cases but Subclinical infections are relatively high; the subclinical to clinical infection ratio being 125-500:1. The present study was undertaken to check the prevalence of JE virus in Culex spp of adult mosquitoes and larvae in and around Mumbai. Mosquitoes and larvae were collected from 5 regions. The larvae and mosquitoes were crushed in sterile saline and the homogenates were passed through 0.22 micron filter. Filtrates were divided in two parts, one of it was used for RNA isolation and the other part was added on BHK-21 cell culture monolayer in 24 well plates for virus isolation. The isolated RNA was then subjected to nested PCR. BHK-21 cells were assessed for cytopathic effect.

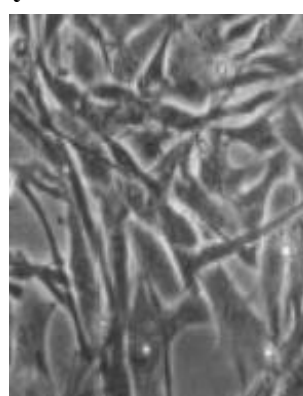
All the samples tested were negative for JEV, both by PCR and Cell Culture.



Cell Culture Control



BHK Virus Control



Test – Negative for Virus

Location	Larvae collected	Adults collected
Kharghar	22	14
Kalyan	32	7
Antophill	48	8
Bandra	16	9
Vasai	45	13

Table- The areas from which larvae and adult mosquitoes were collected

ON-GOING PROJECTS : PHD PROJECTS

1. Immunogenicity Study of Recombinant Dengue Gene Construct in Mice

Investigator	Mr. Ajit A. Kulkarni
Guide	Dr. Ranjana A. Deshmukh
Co-guide/mentor	Dr. Abhay Chowdhary

Dengue virus infection is now recognized as one of the most important mosquito borne human infections of 21st century. Because of its complicated immunopathological mechanism and the correlates of protection are still to be defined, the development of dengue vaccine effective against all four serotypes is still not possible. Immunity to Dengue viruses is primarily mediated by neutralizing antibodies directed against envelope (E) glycoprotein. T cell responses are also considered to be important for controlling and sometimes clearing a viral infection. The study aims to develop the recombinant Dengue gene constructs encoding envelope domain III for all Dengue serotypes and to assess immunogenicity in murine model. The study expects to provide important information on the immune responses elicited by the recombinant Dengue gene constructs and to determine the correlates of protection. The study will provide a promising direction for dengue vaccine development.

Major Breakthrough of the Project

- Recombinant tetravalent vaccine based on dengue envelope domain III has been constructed.
 - Sequence of vaccine candidate has been submitted to GenBank (Accession No. KF855114)
 - Protein expression has been tested in 293T cell line by immunofluorescence assay.
-

2. Molecular Characterization Of 2009 H1N1 Pandemic Influenza And Seasonal Influenza Viruses From Patients In Mumbai Region

Investigator	Ms. Devanshi J. Gohil
Guide	Dr. Ranjana A. Deshmukh
Co-guide/mentor	Dr. Abhay Chowdhary

Influenza (commonly referred to as “flu”) is one of the most commonly known viral diseases that represent a health and economic threat to both humans and animals worldwide. Two types of antigenic variations occur in the HA and NA genes. The first kind of variation, called antigenic drift, involves point mutation and secondly, antigenic shift in which the new strain would be expected to vary at the amino acid level 20–50% from the corresponding protein of previously circulating strains. Thus antigenic shifts are responsible for worldwide pandemics, which occur at irregular and unpredictable intervals.

Haffkine Institute for Training, Research and Testing is a Regional Center for testing of pandemic H1N1 Influenza samples in and around Mumbai region. Greater than 6000 samples have been received and preserved in a –80°C deep freezer till date. A minimum of 100 samples positive for 2009 H1N1 pandemic by rRT-PCR and minimum of 100 samples positive for seasonal influenza A by rRT-PCR will be included in this study. Isolation of influenza virus for the samples will be processed on Madin Darby Canine Kidney (MDCK) cells. Seasonal Influenza A will be sub-typed by real time PCR using primers specific for H1 and H3. Viral RNA segments for HA, NA and M gene of pandemic H1N1 influenza and seasonal influenza virus will be amplified specifically by conventional RT-PCR and identified by agarose gel electrophoresis. Sequence analysis of the PCR product will be carried out using commercially available sequencing primers.

Drug susceptibility of viral isolates for 2009 H1N1 and seasonal influenza viruses will be studied genetically by sequencing and phenotypically using commercially available kits.

Major Breakthrough of the Project

- 16 sequences each for the M gene and NA gene of the seasonal influenza H3N2 have been submitted and published with the GenBank (Acc. No. KJ511817 – KJ511848).
 - All the isolates of the seasonal influenza H3N2 are resistant to amantidine and susceptible to Oseltamivir.
-

3. Study of Neuronal Proteome in Prognosis of Rabies in Murine Model

Investigator	Ms. Shraddha Mehta
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	

Rabies, one of the oldest known and a 100% vaccine preventable disease causes encephalitis that almost always proves to be fatal. The burden of the disease is quite high with nearly 20,000 people dying of rabies each year in India only. Presently, the following aspects of the disease are being investigated in murine model. The study is focused on assessing proteomic changes that may be occurring in the neurons of rabies infected animals using different strains of the virus. It is primarily being carried out to isolate, identify and investigate the role of differentially expressed viral as well as host proteins that may be involved in neuronal dysfunction.

4. To Study siRNA Associated Suppression Of Rabies Virus Infection And Assess Its Therapeutic Potential

Investigator	Ms. Prerna Charan
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	

Rabies virus belonging to genus Lyssavirus of family Rhabdoviridae causes one of the oldest neurodegenerative diseases known to mankind. Rabies virus is an enveloped, non-segmented negative-stranded RNA virus. As per the WHO studies about 55,000 deaths are still an attribute of rabies infection. Rabies virus has approximately 12 kb long single stranded RNA genome consisting of a leader region followed by genes encoding Nucleoprotein (N), Larger Polymerase (L), Matrix Protein (M), Glycoprotein (G) and Phosphoprotein (P). Antivirals currently used against rabies include ketamine, midazolam, ribavirin and amantadine, but only one successful case of human treatment happened in 2004. RNA interference (RNAi) is a system within living cells that takes part in controlling the genes which are active and how active they are. Short RNAs can direct repression of genes with homology to those short RNAs. This repression is called RNAi. The purpose of this study is to understand the RNAi process and its application in suppressing rabies virus infection in humans. In this study, we will target the viral proteins like Nucleoprotein and Large Polymerase with siRNA designed specifically to be homologous to their mRNAs and observe the effect on the viral replication as the targeted proteins and enzymes are crucial for viral replication.

5. Characterization and Assessment of Differential Proteome in Patients with Acute Respiratory Infection

Investigator	Mr. Rahul Chavan
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	

Acute Respiratory Infection (ARI) is a major cause of morbidity and mortality around the globe. It is estimated that around 2 million people suffer from ARI from various etiologies (bacterial, viral and fungal) every year. However there is no simple diagnostic marker for the assessment of the etiology of these conditions. The objectives of the study are assessing the samples for various respiratory viruses and bacterial infections which particularly go un-detected out on a surveillance basis. The next objectives are to aid in understanding the differential protein profile between the normal and the infected sample which further will shall help to use those proteins on a diagnostic or therapeutic role. This would be very helpful in enabling the establishment of the proteomic model for studying the protein expressions which will help leading to development of a supportive therapy to reduce the burden of infections on the society.

6. A Comparative Study of the Level of Expression Of IFITM Proteins in Influenza Virus Infection Across Species

Investigator	Ms. Pialy Chatterjee
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	

Influenza epidemics exact a formidable toll on world health. Moreover, viral super-infections can produce antigenic shifting, resulting in more virulent pathogens. Recently, the emergence of a novel influenza A H1N1 viral strain led to a pandemic, producing illness in over 200 countries and territories (World Health Organization Pandemic (H1N1) 2009 - update 75). Additionally, the related avian influenza A viral strain, H5N1, represents a potentially catastrophic global health risk.

Interferon-induced transmembrane (IFITM) genes are transcribed in most tissues and are with the exception of IFITM5 interferon inducible. The interferon induced transmembrane (IFITM) genes IFITM1, IFITM2 and IFITM3 (IFITM1-3) belong to the family of small ISGs. Its members are induced in response to viral infections. IFITM proteins protect against viral challenges depending on the type of the virus/strain in addition to the IFITM properties. The study aims at a comparative analysis of the level of expression of the IFITM (1-3) proteins across species on infection with varied strains of influenza virus.

7. Study of Potential Therapeutic Activity of Gold Nano Particles against HIV

Investigator	Mr. Rohan Kesarkar
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	

Given the backdrop of current antiretroviral therapy and timeline required for newer anti-HIV drugs to be made, the current dissertation tends to explore nanotechnology to combat this veritably omnipresent and intelligent virus. Objective of the study is to investigate the anti-HIV activity of gold nanoparticles as well as assessing their capability as a potential carrier for available antiviral drugs.

Research on gold nanoparticles (GNP) with respect to its biomedical applications has gained a tremendous resonance in recent years. High stability, high carrier capacity, feasibility of various routes of administration, inertness, non-toxic nature and high biocompatibility make GNP ideal starting point for drug carrier construction. These properties of nanoparticles enable improvement of drug bioavailability and reduction of dosing frequency and may solve the problem of non-adherence of prescribed therapy. Apart from using these nanoparticles as carrier system, GNP can also be explored as a potent anti-viral agent. Focus would also be given in improving drug loading and release kinetics of attached anti-viral onto GNP and synergistic activity of GNP with attached anti-viral for HIV.

8. Assessment of Plant Proteins/Peptides as Potential Anti-Viral Agents

Investigator	Mr. Sandeepan Mukherjee
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	

Anti-virals are the mainstay in treatment and management of Viral Diseases in Humans. However a large number of viral diseases have no known anti-virals. Also the fact, that emerging drug resistance makes the available anti-virals ineffective, calls for the development of novel anti-viral molecules. Plant peptides and secondary metabolites are known to have potent antiviral activity. Although most such activities are directed against plant viruses, the mechanism of action remains common for most anti-virals. The present study shall investigate the potential antiviral activity in Plant protein/peptides against Influenza and HIV.

9. Biosynthesis of Nanoparticles & It's Potential Therapeutic Applications

Investigator	Mr. Kapil Punjabi
Guide	Dr. Sunita D. Deshpande
Co-guide/mentor	

Nanoscale particles have great potential in diagnosis and treatment of various diseases because of their unique biological effects based on its size that differentiates them from traditional drugs. Although there are organisms reported for synthesis of nanoparticles, in this study a never studied before environment will be analyzed for presence of bacteria capable of synthesizing nanoparticles. Bacteria isolated from soil and effluent of silver electroplating industry will be screened for synthesis of silver nanoparticles. The isolate screened positive shall be evaluated for capability to synthesize other metal nanoparticles like gold and copper and. All nanoparticles shall be characterized for its size, shape & conformity using various analytical techniques like electron microscopy and other spectral studies.

To evaluate therapeutic activities of nanoparticles, toxicity studies will be carried out on normal & cancerous cell lines. Expecting that lower concentrations of nanoparticles will be highly toxic to the tumor forming cells while normal cells will be potentially unharmed. Assessment of antimicrobial properties shall derive eventual application of nanoparticles in treatment of pathogenic bacteria and its drug resistant species. If certain concentrations of nanoparticles are non injurious to normal cell but lethal to pathogenic bacteria or if nanoparticles and antibiotics are found to synergistically more effective against pathogens an opportunity to develop better treatment is workable.

Major Breakthroughs of the Project

For this study 6 samples [1 soil & 5 effluents] have been collected from silver plating industry around Mumbai. Out of these, 9 bacteria were isolated and further screened for synthesis of silver nanoparticles. 2/9 isolates were found capable of synthesizing silver nanoparticles. The crude nanoparticle preparation was found to have antibacterial activity against *Staphylococcus aureus* ATCC 25923 & *Escherichia coli* ATCC 25922.

10. Assessment of Novel Molecular Methods for the Diagnosis of Tuberculosis

Investigator	Ms. Suvarna Joshi
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	

The project aims to standardize the Loop mediated isothermal PCR (LAMP) assay as a rapid diagnostic tool for pulmonary and extra pulmonary tuberculosis. The method will be initially standardized using standard strain of *M. tuberculosis* and then validated using clinical specimens of pulmonary and extra pulmonary tuberculosis. The samples shall also be evaluated with conventional diagnostic methods including culture on semi solid Lowenstein Jensen (LJ) medium and Liquid medium (BACTAC), Demonstration of Acid Fast Bacilli by Ziehl-Neelsen staining and Demonstration of *M. tuberculosis* DNA by Real Time PCR. The sensitivity and specificity of the LAMP assay shall be determined. This shall help us developing a cost effective a rapid point of care diagnostic technique for tuberculosis. The second part of the project aims to develop a allele-specific depletory PCR (ASD-PCR) assay for the detection of isoniazid and rifampicin drug resistant strains of *M. tuberculosis* in the study cohort.

Major Breakthrough of the Project

Sputum samples from 250 patients suffering from/ suspected of pulmonary tuberculosis and extra pulmonary tuberculosis were collected. Detection of *Mycobacterium tuberculosis* in samples was done by using standard method of ZN staining & culturing onto LJ medium. DNA from Processed Samples extracted by using Qiagen Kit based Methods. Conventional Nested PCR for detection of *M. tuberculosis* from sputum sample was done and all the samples were tested by using the same. Standardization of LAMP assay for detection *M. tuberculosis* from samples was done. Standardization of allele specific depletory PCR assay for detection of isoniazid and rifamicin resistance of *M. tuberculosis* from samples is in Process.

11. Molecular characterization of methicillin resistant *Staphylococcus aureus* (MRSA) isolates in Mumbai

Investigator	Mr. Arunagiri Subramanian
Guide	Dr. Ranjana A Deshmukh
Co-guide/mentor	Dr. Abhay Chowdhary / Dr. Shashikant Vaidya / Dr. Rajas Warke

Methicillin Resistant *S. aureus* (MRSA) a drug resistant variant of *S. aureus* has been a global public-health problem since the 1960s because of its resistance to several antibiotics. Many of these strains are becoming multidrug-resistant and are susceptible only to glycopeptides such as Teicoplanin and Vancomycin. Incidence of MRSA shows a large variation in its distribution from 6.9% - 81% in various parts in India. The emergence and rapid spread of MRSA has posed a new challenge for infection control in hospitals settings.

The control of disease transmission by MRSA, in hospitals/communities has been recognized as a major challenge. Genotyping data from large international studies have shown that a few clones of MRSA are responsible for the spread of the disease in various parts of the world.

Molecular typing will be useful in establishing clonal relationship between isolates, for e.g., to determine whether the isolates arise from the same clone or from a different source. Hence it is of importance to track down and find out which clones of MRSA are responsible for infections in the hospital and community environment. The information obtained can aid in epidemiologic studies, thorough surveillance and in detecting the emergence of new pathogens subtypes.

Major breakthrough of the project

This study described standardization of two multiplex PCRs for characterizing MRSA. This study reports the first finding of SCCmec type II in Mumbai with high proportions of SCCmec type V and IV along with their subtypes suggesting strong infiltration of CA-MRSA isolates in hospital settings.

12. Synthesis & Study of Heterocyclic compound as possible therapeutic agents

Investigator	Ms. Vrushali N. Patil
Guide	Dr. Anil S Bobade
Co-guide/mentor	

Benzothiazole are an interesting group of compound and biological activities of this class of compound that are reported in literature are anti-cancer, anti-microbial, anti-tubercular, antibacterial activity.

All the above observation indicates the importance of benzothiazole as biologically active moieties. Taking into account above mentioned fact, it was decided to synthesize new molecule Triazolo- benzothiazole which will further studied for their in vitro antibacterial activity.

We have synthesized Triazolo-benzothiazole by using 2-amino benzothiazole and hydrazine hydrate in ethylene glycol to form hydrazino benzothiazole which further is treated with CS₂/KOH to form Triazolo benzothiazole.

The structure of new derivatives of Triazolo- benzothiazole was confirmed by spectral analysis. The synthesized compound will be analyzed on the basis of IR, TLC, and NMR analysis. Such a number of heterocyclic derivatives play an important role in the control of various microbial diseases and hence, in this present study a new series of heterocyclic compounds have been synthesized and studied for their properties as anti-bacterial and anti-fungal agents.

13. Assessment of Potential Anti-viral Activity of Indian Medicinal Plants against Rabies Virus Causing Encephalitis

Investigator	Mr. Soumen Roy
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	

Antiviral chemotherapy is an important component in the management of viral diseases. However at present potent antivirals for clinical usage are available only against limited number of family of viruses (Orthomyxoviridae, Herpesviridae, Retroviridae). There are no potent antiviral drugs against rabies virus. Therapeutic human rabies immunoglobulin (HRIG) and vaccine is available against rabies virus but it is ineffective once the virus enters the CNS. This necessitates the need for development of novel antivirals against rabies virus. Plant secondary metabolites have tremendous potential to be antiviral agents. *Datura metel*. has long been known for its sedative action and known to cure hydrophobia in ayurveda and *Cynodon doctylon* is known to possess anti inflammatory and immunomodulatory activities. Thus these two medicinal plants may therefore be explored for potential antiviral activity against Rabies virus causing encephalitis.

14. Synthesis & study of Heterocyclic compounds as possible Anti-Microbial agents

Investigator	Mr. Ashish L. Asrondkar
Guide	Dr. Anil S Bobade
Co-guide/mentor	

It is well documented that various heterocyclic organic compounds such as Benzothiazole, Benzimidazole, triazole, Oxadiazole, coumarin and piperazine etc shows promising biological activities.

The chemistry of heterocyclic compounds has been an interesting field of study for a long time. The synthesis of novel oxadiazole derivatives and investigation of their chemical and biological behavior have gained more importance in recent decades for biological, medicinal and agricultural reasons. 1, 3, 4-Oxadiazoles represent an important class of heterocyclic compounds. Their derivatives possess a broad spectrum of biological activity in both agrochemicals and pharmaceuticals such as anti-malarial, anti-HIV, anti-tubercular activities.

Literature survey shows that Benzimidazole derivatives play a vital role in biological fields such as anti-diabetic, anti-microbial, antiviral activities. The above present work describes the synthesis of some new substituted oxadiazole derivatives as a possible anti-microbial activity.

The synthesized compound will be confirmed by IR, TLC, and NMR analysis. The substituted oxadiazole derivatives will be evaluated for their in vitro anti-microbial activity. The prepared compound will be screened against *E. coli* and *S. aureus* ATCC 3750 bacterial strain.

15. Evaluation & synthesis of new biological entities as possible Anti-bacterial & Anti-Fungal agents

Investigator	Ms. Neha U.Mishra
Guide	Dr. Anil S Bobade
Co-guide/mentor	Ms. Vrushali N. Patil

Coumarin is a chemical compound in the benzo-pyrone chemical class; Coumarin is used in the pharmaceutical industry as a precursor molecule in the synthesis of a number of synthetic anticoagulant pharmaceuticals. Coumarin has clinical medical value by itself, as an edema modifier. Coumarin and other benzo-pyrone, such as 5, 6 benzo-pyrone, 1, 2 benzo-pyrone, diosmin, and others, are known to stimulate macrophages to degrade extracellular albumen, allowing faster resorption of edematous fluids. Other biological activities that may lead to other medical uses have been suggested, with varying degrees of evidence.

Coumarins nucleus have shown some evidence of many biological activities, although they are approved for few medical uses as pharmaceuticals. The activity reported for substituted coumarin includes anti-HIV, anti-tumor, anti-hypertension, anti-arrhythmia, anti-inflammatory, anti-osteoporosis, antiseptic, and analgesic. It is also used in the treatment of asthma. Coumarin has been used in the treatment of lymph edema.

Considering all the activities of coumarin nucleus and its derivatives it was decided to form its hydrazino which was further fused with series of aromatic aldehydes and its hydrazino was cyclised which was further fused to acid chloride. The so formed molecule will be further tested for various activities like anti-microbial, anti-inflammatory and anti-oxidant to determine whether so formed molecule shows any enhanced activity or not.

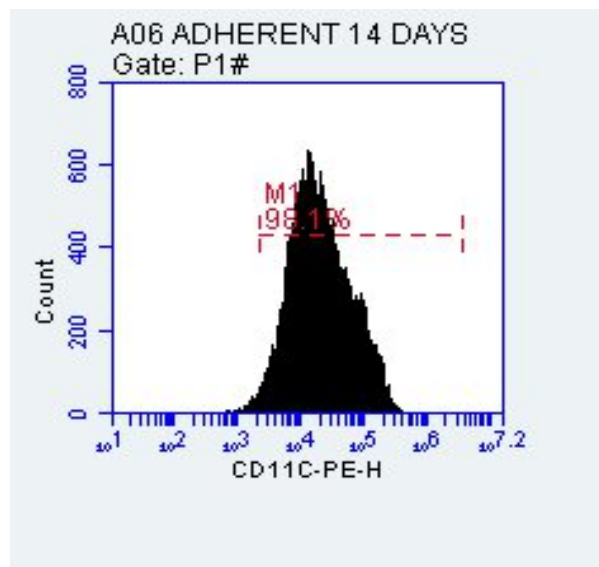
16. Assessment of Dendritic cell vaccine as a potential immunotherapeutic agent in Malaria

Investigator	Mr. Rahul Ashok Gosavi
Guide	Dr. Ranjana A Deshmukh
Co-guide/mentor	Dr. Abhay Chowdhary

Malaria is a vector born infectious disease affecting approximately 40% of the world population. South-East Asia region 10 out of 11 countries are malaria endemic. India itself contributes about 64% of the total malaria cases. Use of Dendritic cells as a vaccine for the development of Immunotherapy strategies is also one of the approach to stimulate innate immune response against malaria. Our aim is to sensitize Dendritic cells with merozoite antigen and check the immune response elicited *In vivo* and *In vitro* against *Plasmodium berghei*/ *Plasmodium yoelii* malaria in murine model. Expressions of different cytokines will be check. The Dendritic cells will be purified and will be loaded with merozoite specific antigen in the merozoite induced malaria murine model. Flow cytometry will be used to detect and to quantify *In vivo* merozoite specific cytotoxic killing activity in the injected mice. Quantitation of cytokine production by Dendritic cell will be determined by using commercial ELISA kit. Expression of different cytokine will be studied using molecular technique. The study expects to analyse the Dendritic cell response *In vivo* and *In vitro* against *Plasmodium berghei*/ *Plasmodium yoelii* in murine model. If this strategy of immunizing mice against *Plasmodium berghei*/ *Plasmodium yoelii* shows promising results, similar concept may be applied in human malaria targeting *Plasmodium falciparum*.

Major breakthrough of the project

Our aim is to sensitize Dendritic cells with p-RBC's or merozoite surface protein antigen and check the immune response elicited *In vivo* and *In vitro* against *Plasmodium berghei* / *Plasmodium yoelii* malaria in murine model. If this strategy of immunizing mice against *Plasmodium berghei* / *Plasmodium yoelii* shows promising results, similar concept may be applied in human malaria targeting *Plasmodium falciparum*.



We have isolated 98.1 % pure Dendritic cells from mouse bone marrow cells. The further work is to check the immune response elicited against *Plasmodium yoelii* infected mice. On observation of optimum efficacy of Dendritic cells as a vaccine candidate, the same will be evaluated against *Plasmodium falciparum* *in vitro*.

17. Assessment OF BCG as an Adjuvant for Japanese Encephalitis Virus Vaccine

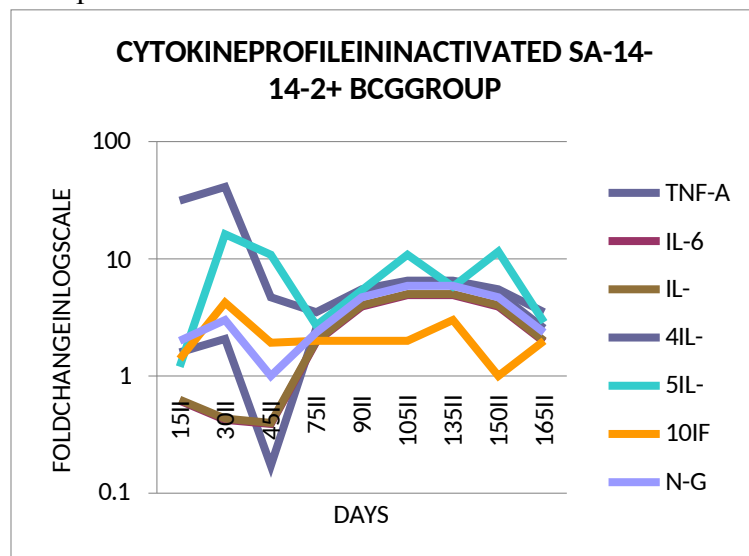
Investigator	Mr. Sahil Kulkarni
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	

In this study we propose to construct a safe and efficacious recombinant BCG based JEV vaccine expressing the most immunodominant antigen of JEV the D-III protein. JEV culture shall be used to extract the DIII gene which is known to confer immunity against JEV. The extracted gene will be amplified using RT-PCR and cloned in *E.coli*, this will be expressed in a BCG host. This recombinant BCG-JEV (rBCG-JEV) along with other different formulations will be inoculated subcutaneously (s.c) in BALB/c mice. These animals will be vaccinated with prime boost approach. Immune response to the various preparations shall be evaluated by assessing the surrogate markers like neutralizing antibody response, CTL Response and Th1/Th2 response. This novel approach would lead to elicitation of a protective immune response with reduction in not only the volume and dose of the vaccine to be administered but also in terms of the number of booster doses required to elicit and maintain the level of neutralizing antibody response over long periods of time. This may pave way for safe and efficacious JEV vaccination programs.

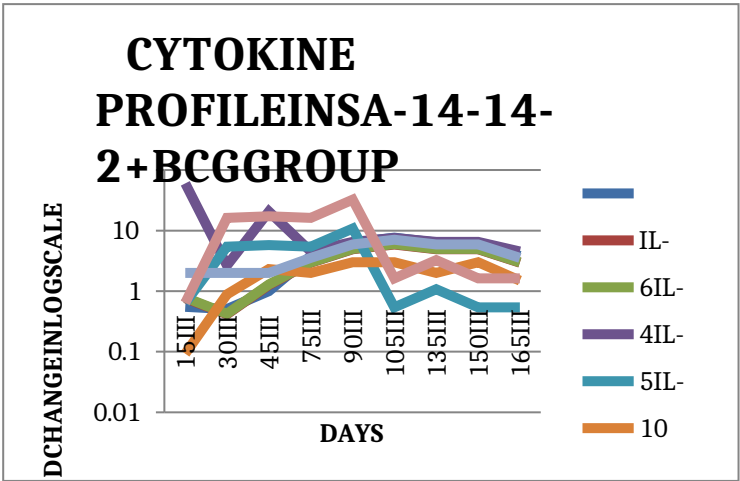
Major breakthrough of the project

Cytokine results

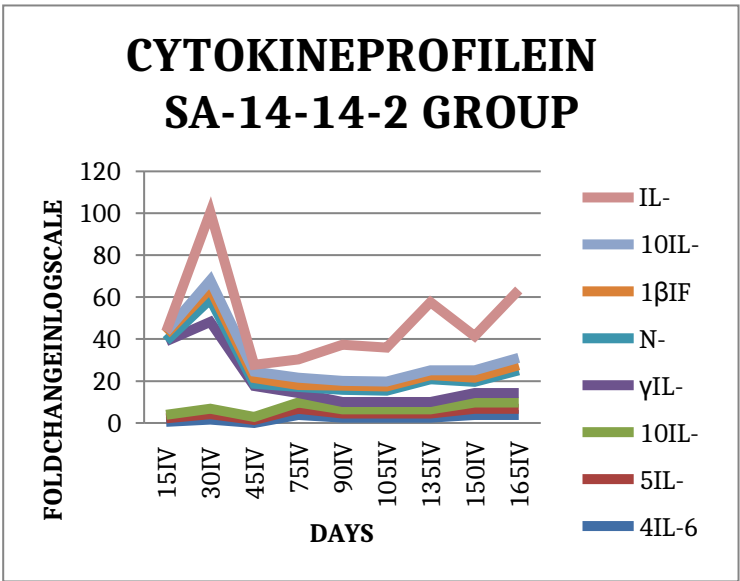
Group : Inactivated SA14-14-2 and BCG



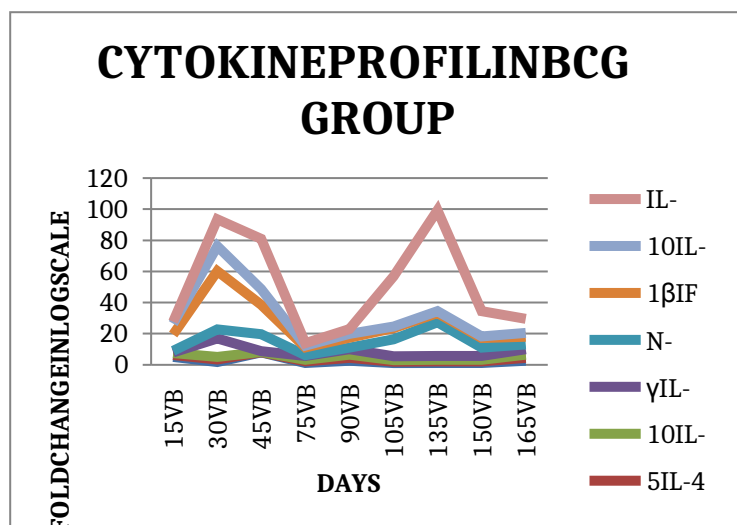
Group : SA14-14-2 and BCG



Group : SA14-14-2



Group : BCG



The current study employed is our approach to combat JE by increasing the efficacy of live attenuated SA14-14-2 Je vaccine using BCG as an adjuvant. BCG has been proved to be a wonder molecule in boosting the immune responses (both humoral and cell-mediated) to unrelated antigen. This vaccine has been used widely against TB and has low side effects.

- BCG induces IFN-gamma production resulting in massive filtration of macrophages and neutrophils resulting in non-specific resistance to the virus. Moreover IFN-gamma results in antiviral state.
- BCG enhances the production of Th2 cytokines- IL-4 and IL-5 when administered along with JE vaccine. This results in generation of strong humoral immunity which is essential for protection against JEV

Thus BCG is shown to enhance immune response in group where it was injected along with SA14-14-2 as compared to the conventional immune response generated in group which was injected with SA14-14-2 alone. A strong immune response towards humoral branch provide long-lasting immunity to the virus. The study can be further carried out by determining the levels of neutralizing antibodies in the serum by suitable immunoassays like ELISA. A further challenge experiments can be worked upon the study groups to assess the level of protection against JEV in presence or absence of BCG. Also the fact that BCG is an established safe vaccine in the neonates, the age group to which the JE vaccine may be administered may also be lowered. Also this may give us newer insights into developing a new vaccine and improving the existing ones. Similar studies can be carried out with other flaviviruses so that a better immunization program can be scheduled for infants.

18. Interplay of Trace Elements in the Pathophysiology of Murine Model of Malaria

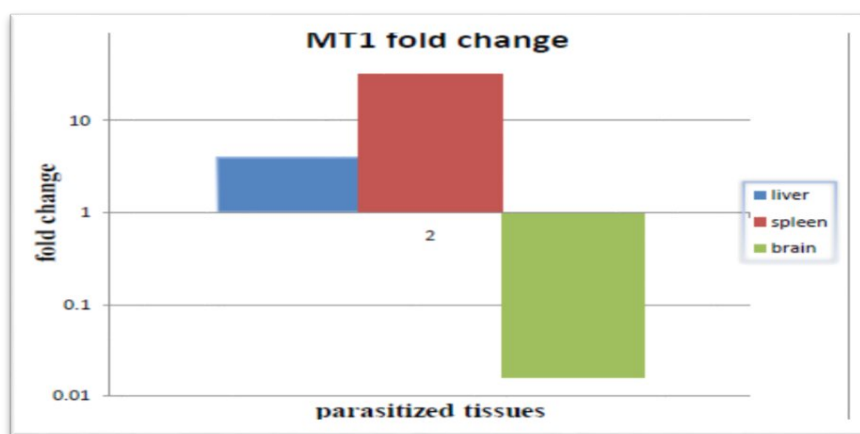
Investigator	Ms. Mansi Rajendra Malik
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	

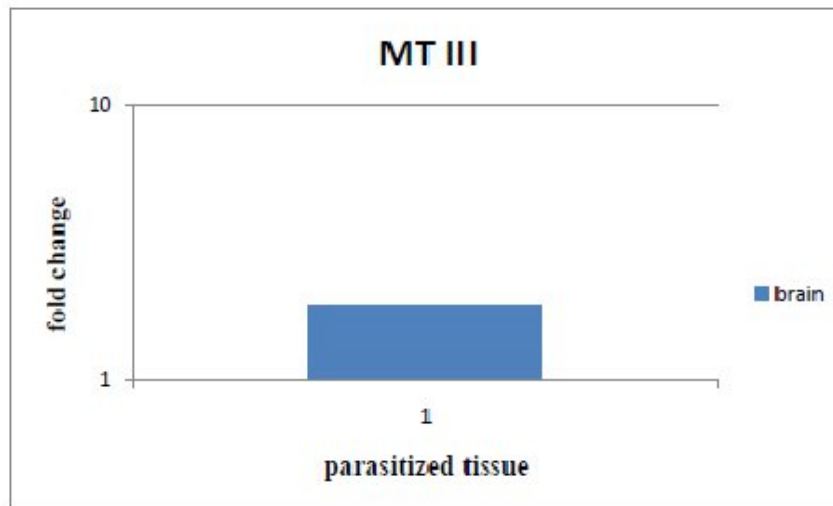
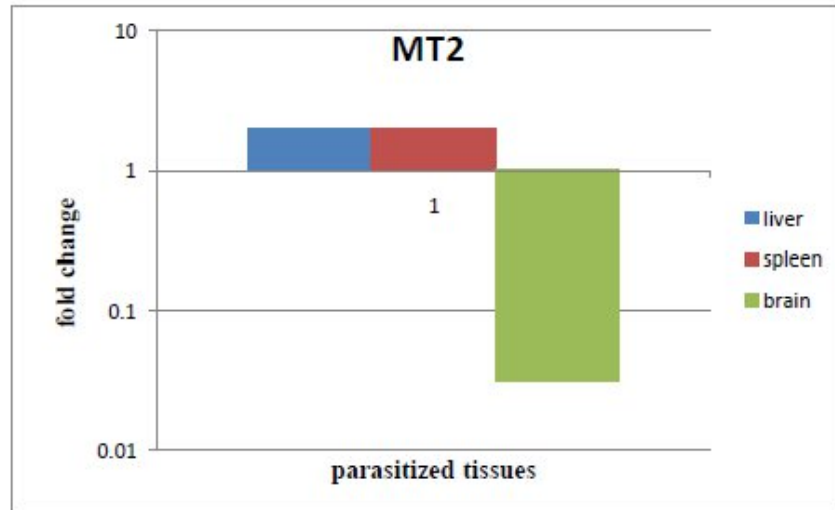
The studies on malaria prove that oxidative stress generated during the infection is the root cause of the pathogenesis of the disease.

The Reactive Oxygen Species (ROS) and Reactive Nitrogen Species (RNS) generated during the infection are toxic to the cells and thus the parasite is endowed with a complete network of enzymes and proteins that protect it from those threats.

Due to oxidative stress there is an imbalance in the trace element pool of the body as redox enzymes, usually accompanied with a metal cofactor, help in maintaining physiological harmony in the body.

The study expects to aid in the understanding of the pathophysiology of malaria disease progression. The tissue specific metallome profile shall help in finding out the correlation between the levels of these trace elements with the transition of the disease from a milder form to a severe form. The metallothionein expression along with Metalloproteins such as Transferrin, ceruloplasmin etc shall help in understanding the presence of metal binding protein in the tissues in response to the oxidative stress due to the disease conditions. Also the study shall aid in providing an insight into the therapeutic intervention for decreasing the pathogenesis of the disease by administering the appropriate metal chelator or metalloprotein. The study shall be carried out in two different mice strains one susceptible to and one resistant to cerebral malaria thus providing an overview on the differential metallomic expression pattern, the host differences in the resistance patterns of the disease and the relative pathophysiological changes. The study shall thus be very helpful in enabling the establishment of a disease model for studying the pathophysiology of malaria and the results can be applied to humans, thus leading to development of a supportive therapy to reduce the pathology of malaria drug resistance is the major problem





19. Isolation and characterization of *Toxoplasma gondii* antigens and assessment of its tumour suppression activity

Investigator	Mr. Apurva S Gode
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	

Cancer is the most prevalent and lethal cancer worldwide, and has been reported in many nations, including the India and many developing countries. Gliomas also have large contribution in current situation. The mortality rate attributed to cancer may be the result of induced multidrug resistance and a high frequency of metastatic occurrence. The current approaches of treatment include surgery, radiation, and chemotherapy which can also adversely affect the normal cell population in the patient. The infiltrative growth pattern of gliomas means that not every last tumour cell can be surgically removed. Radiotherapy as well as chemotherapy have certain limitations pertaining to normal tissue toxicity. Thus there is a need for an alternative form of treatment to overcome these problems. A new approach for the treatment of glioma is therefore evident. Immunotherapy may represent one such approach, and several different strategies for glioma immunotherapy have recently been developed. The goal of cancer immunotherapy is to augment the weakened host immune response against tumors using specific and/or nonspecific immune stimulants. Some of the reports suggest that *T. gondii* is a powerful agent for cancer immunotherapy, and is useful as a stimulant of the cellular immune responses.

20. To Assess the Contribution of Sweat in Parasite Induced Attractiveness to Insect Host in Malaria Patients

Investigator	Mr. Chinmayanand Oroskar
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	

Protozoan parasites of the genus *Plasmodium* infect a wide variety of vertebrates, and are responsible for the devastating impact of malaria in humans. Parasites' twofold evolutionary concern is to multiply and be transmitted between hosts. So in order to facilitate its transmission from human host to mosquito, the prime intention of the parasite will be to attract the mosquito towards its human host. As it has been observed in the previous studies, that malaria infection increases attractiveness of humans to mosquitoes and taking into consideration that humans are potent attractants to mosquito, the parasite must be inducing some changes in its host, such that it becomes more attractive to the mosquitoes. Human sweat contains components that are attractive to anthropophilic mosquito species, and variation in sweat composition causes differential attractiveness to mosquitoes within and between individuals and also between humans and other mammals. Thus there lies a scope for the parasite; whose ultimate aim is to disseminate to the insect host i.e. mosquito (in order complete its lifecycle); to alter the composition of sweat in such a way that it would attract the mosquitoes. Thus this study will help to understand if the parasite is inflicting some change in the composition of sweat in such a way that it helps its transmission to the insect host. The understanding of how exactly does the parasite make the modifications in the sweat to cause the attractiveness; would be the outcome of this study.

21. Comparative Assessment of Immunomodulatory Activities of Plant Extracts And Their Synthesized Nanoparticles

Investigator	Mrs. Pallavi Chetan Choudhary
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	

The immune system involved in the etiology as well as pathophysiologic mechanisms of many diseases. Currently available immunosuppressive and immunostimulating agents have major limitations. Immunomodulation using plant material can provide an alternative to conventional chemotherapy for a variety of diseases.

Discovery of new molecules and manipulating those available naturally in nanosize could be appealing for their greater potential to improve health care. Hence our aim is to synthesize novel gold nanoparticles using plant extracts as reducing agents; characterized them and comparatively assess the immunomodulatory activity of plants and synthesized gold nanoparticles taking into consideration that enhanced immunomodulatory activity will be obtained using gold nanoparticles.

The study helps us to design the novel method for the synthesis of gold nanoparticles. The study expects detailed understanding of immunomodulation of mentioned plants and their synthesized nanoparticles and will open new ways for a number of potential therapeutics as innovative therapeutic agents for infectious diseases, cancer, various life threatening immune mediated diseases and will be efficiently used to overcome the problem of multidrug resistance in many diseases like malaria, tuberculosis, etc.

22. Plasmid diversity in *Pseudomonas aeruginosa* from different clinical sources

Investigator	Mr. Rohan Dattatraya Dudhale
Guide	Dr. (Mrs) Sunita D. Deshpande
Co-guide/mentor	

A plasmid is a genetic material that can replicate in a controlled way physically separate from the chromosome. Plasmids are extremely diverse & distributed universally in a range of hosts & ecological niches. They are present in all branches of the bacterial 'tree of life' & have been found in all bacterial communities studied to date, including soil, marine and clinical environments. Plasmids have a dominant role in the horizontal transfer of genetic information between bacteria & can transfer DNA between genera, phyla & even major domains by a mechanism that is known as bacterial conjugation. Plasmid as agents of horizontal gene transfer (HGT), plasmid contributes considerably to bacterial evolution & adaptation. It also plays a critical role in rapid bacterial adaptation to local environmental changes, as best exemplified by the alarmingly rapid spread of plasmid encoded multidrug resistance in human pathogens. Plasmid sequencing also provides valuable insights into their evolution, confirming their mosaic nature based on genetic modules of different origins & indicating the importance of recombination, co integration & mobile elements insertions in plasmid diversity. *Pseudomonas aeruginosa* is one of the common pathogens responsible for variety of infections particularly burn wound infection, UTI and nosocomial infections. It is established as key colonizers of burn wound as it flourishes on damp burn wound surface and endures well in hospital environments, once established; it can persist for long periods of time in a system. However what makes such infestations reach grave depths is the ability of *Pseudomonas aeruginosa* to acquire drug resistance. Such drug resistance has been primarily attributed to acquisition of plasmids carrying specific drug resistance traits. Plasmid associated genes are easily transferred across members of same and other species by means of Horizontal Gene Transfer. To make matters worse *Pseudomonas aeruginosa* can attain characters like degradation of hydrocarbons and tolerance to significant concentrations of Heavy metals, courtesy such plasmids. These can make the bacteria resistant to common disinfectants based on Quaternary Ammonium Compounds and Phenols as principal components. Thus such, plasmid transfer aid in maintenance of *Pseudomonas aeruginosa* in hospital and health care set-ups making them highly potent candidates of nosocomial infections. The present study therefore proposes to study such genetic diversities in the plasmids of drug resistant strains of *Pseudomonas aeruginosa* which are resistant to common antibiotics used in the treatment of *Pseudomonas* infection, Heavy Metals, Quaternary Ammonium compounds and Phenol based disinfectants. These shall help us elucidate and understand mechanisms of HGT occurring during such events. To be able to identify the resistance patterns to antibiotics, heavy metals and hydrocarbons via their different pathways shall be of great significance in planning management strategies for such adverse conditions. Understanding the role of plasmids in such events shall help us elucidate the position of Horizontal Gene Transfers. Also sequence analysis shall help us identify the diversity of plasmids transferring such characters and the varied mechanisms of HGT in *P. aeruginosa*. It will also help us create clusters of genes which are frequently associated with such drug resistance.

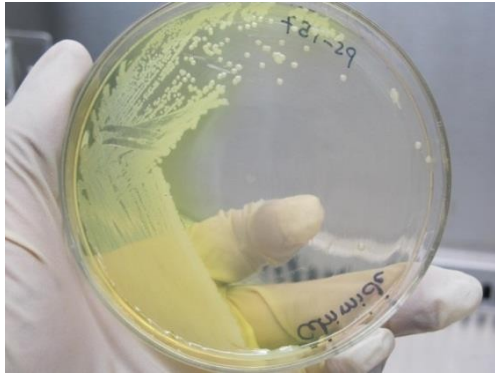


Figure 1.1: Isolation of *Pseudomonas aeruginosa* from different clinical sources



Figure 1.2: Antibiotic Susceptibility Testing of isolated *Pseudomonas aeruginosa*

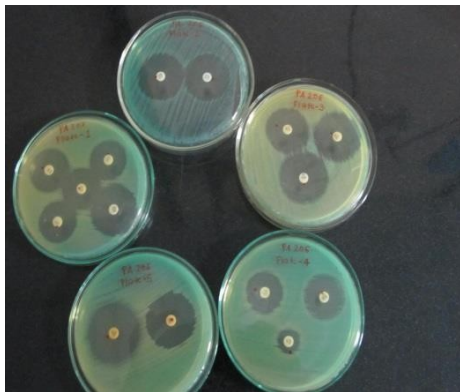


Figure 1.3: *Pseudomonas aeruginosa* shows different antibiotic resistance towards antibiotic classes

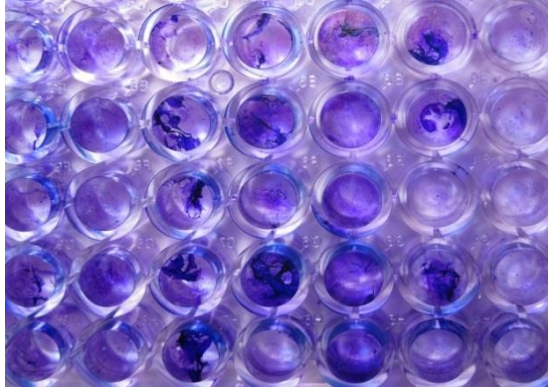


Figure 1.4: Biofilm formation of clinical isolates of *Pseudomonas aeruginosa*

23. Production and Immobilization of Lipase from *Pseudomonas spp.* & Its Applications

Investigator	Mr. Vivek Sudam Vishwe
Guide	Dr. Abhay Chowdhary
Co-guide/mentor	

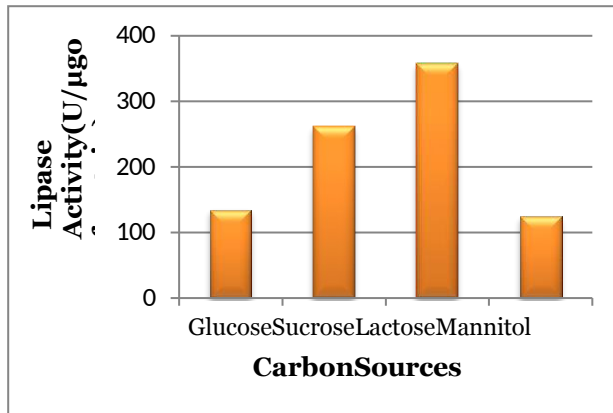
Lipases are enzymes which catalyze the hydrolysis of triacylglycerol into a diacylglycerol and fatty acid. Microbial lipases have been widely used for biotechnological applications in fat hydrolysis, food ingredients, detergents, dairy and textile industries, production of surfactants and oil processing. *Pseudomonas spp.* are easy to cultivate & grow under normal laboratory conditions. The present study shall hence explore the potentials of these organisms in the production of Lipase enzyme. The present study aims at purifying and characterizing lipase enzyme isolated from *Pseudomonas* strains obtained from various oil contaminated soil and water samples.

Pseudomonas spp. from oil contaminated soil & water samples shall be isolated using suitable enrichment method. The lipase producing strains shall then be screened microbiologically using Tributyrin agar medium as well as biochemically by using Lipase enzyme assay. The growth conditions like Carbon sources, Nitrogen sources, pH & Temperature of selected isolates shall then be optimized. Lipase purification shall be performed by using ammonium sulphate precipitation, followed by dialysis. Lipase enzyme shall then be immobilized using adsorption & entrapment methods. The immobilized Lipase shall be used for the hydrolysis of edible oils and also for detection of lipolysis of butter.

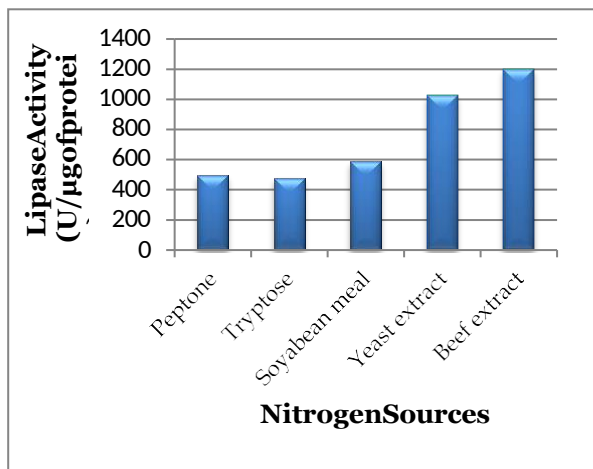
Isolation & characterization of Lipase enzyme from *Pseudomonas* may help us better our preexisting industrial protocols for enzyme mediated lipolysis & Biodiesel Production.



Fig. 1: Colony of isolated *Pseudomonas spp.* showing Lipolysis on Tributyrin agar with Rhodamine B



Graph 1: Effect of Different Carbon Sources on Lipase Activity



Graph 2: Effect of Different Nitrogen Sources on Lipase Activity

24. Interplay of gas transmitters in the prognosis of rabies in murine model

Investigator	Mr. Nakul Shah
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Guide

Co-guide/mentor	Dr Abhay Chowdhary
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Rabies presents with a perplexing pathophysiological mechanisms. Whereas the pathology is still largely un-understood, mechanisms of neuronal dysfunction remains enigmatic and far from being understood. Various small molecules are involved in modulating the neuronal physiology in health and disease. This includes neurotransmitters like GABA, Dopamine, Serotonin, Glutamine, NMDA etc. Recently the role of gas transmitters viz. CO, NO and H₂S have been slowly implicated in regulation and maintenance of homeostasis of various systems like the Cardiovascular system, the Reticuloendothelial system, the Nervous system among others. These molecules have been shown to be of pivotal importance in the management of inflammatory conditions in experimental animal models. Whereas NO is known for its pro-inflammatory role, CO has been identified with having anti-inflammatory activities including down regulation of TLR-4 in CO sensitized macrophages. The role of H₂S in redox potential has also been largely implicated. A growing body of evidence suggests that these gasotransmitters regulate cellular signalling cascades by targeting specific ion channels and that this can dictate toxicity vs protection. These parameters may play a pivotal role in induction of dysfunction in the CNS of virus infected animals.

25. Role of host cell Major Histocompatibility Molecule Class-I in immune responses to Rabies Virus infection

Investigator	Mr. Lalit Samant
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Guide

Co-guide/mentor	Dr. Abhay Chowdhary
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The major cellular component responsible for elimination of virus-infected cells from the host is the cytotoxic T lymphocyte (CTL). CTLs recognize viral antigens on infected cells in association with class I molecules of the major histocompatibility complex. Therefore, any process that alters class I antigens or affects their expression could significantly influence the cellular immune response against viral pathogens. Down regulation of MHC I is observed in many viral infection. With respect to Rabies classical features of inflammation are not observed in neuronal tissue particularly in case of street virus infection. This may be due to modulation of key immune mediators in the CNS by the Rabies virus. The present study is therefore aimed at accessing the role of MHC I in *in vitro* and *in vivo* models of Rabies.

26. Biochemical Parameters in HIV-TB co-infection

Investigator	Mr. Shreewardhan Rajopadhye
Guide	Dr. Suchita Dandekar
Co-guide/mentor	

The magnitude and complexity of HIV-AIDS the rapidity with which the syndrome has spread globally is one of the most important factors contributing to the necessity of its effective treatment. TB is a leading cause of death among persons infected with HIV. HIV and TB co-infection (HIV/TB) are commonly referred to as co-epidemics or dual epidemics. The epidemics can drive and reinforce one another. HIV can activate dormant TB in individuals. If left untreated, someone with active tuberculosis will infect an estimated 10 to 15 people per year. TB is the leading infectious killer of people living with HIV, and accounts for an estimated 13% of AIDS deaths worldwide. The present study mainly focuses on the role of oxidative stress, assesses the role of pleiotropic cytokines and activation of NFκB in HIV, TB and HIV/AIDS study cohort which will help to understand their role and contribution in prognosis of HIV in HIV /TB co-infection. It will also help us to understand the molecular mechanism of the HIV disease and its progression.

Table 1: Oxidative stress parameters in Normal and HIV infected subjects.

	MDA(nmol)	NO(μM)	GSH(μM)	CRP(mg/L)
Normal n=30	0.80 ±0.52	5.90±3.17	521.9±127.06	5.18±8.64
HIV STAGE I CD4: 0-199 n=6	1.21±1.91	8.45±4.89	373.9±233.7	6.96±10.42
HIV STAGE II CD4: 200-499 n=17	0.59±0.27	16.87±13.95	403.8±273.9	4.09±8.24
HIV STAGE III CD4: >500 n=6	0.52±0.29	15.27±14.85	423.5±265.9	6.39±12.63

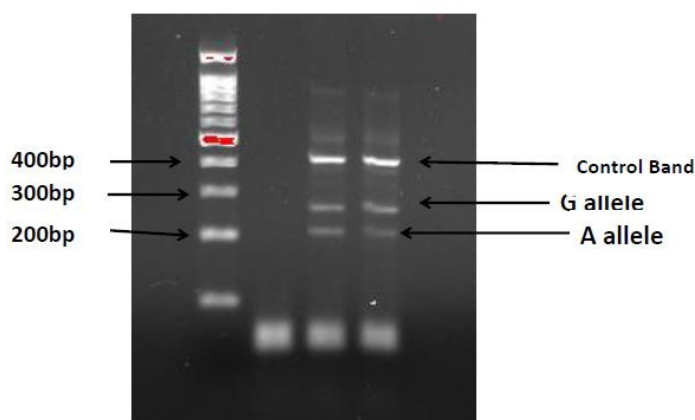
*MDA: Malonaldehyde (Thiobarbituric acid reactive species), NO: Nitric Oxide, GSH: reduced glutathione CRP: C-reactive protein.

Lipid peroxidation was estimated using serum malondialdehyde as a marker, serum nitric oxide levels were assessed by Griess reagent method, serum reduced GSH by Beutler *et al*, serum C reactive protein, serum AOPP by Witko Savark method and serum proteins by Bradford method. Statistical analysis was done using the Student's t test and one-way ANOVA. Significant decrease ($p<0.004$) in GSH levels and significant increase ($p<0.0008$) in NO levels was observed in HIV infected group when compared to controls. However, no significant changes were found in levels of AOPP, MDA, and CRP in the study groups. Significant increase ($p<0.0001$) in MDA levels in group 3 and in GSH levels ($p<0.0395$) in all 3 groups was seen as compared to controls. The findings indicate that considerable amount of oxidative stress are induced and changes in NO and GSH levels may contribute to the immunopathophysiology during HIV infection.

27. Serum Brain Derived Neurotrophic Factor and Gene mutation in Autism spectrum disorders

Investigator	Mr. Nikhil Kasarpalkar
Guide	Dr. Usha Dave
Co-guide/mentor	

The Brain Derived Neurotrophic Factor (BDNF) is one of the proteins within the family of proteins, called as neurotrophins that are responsible for the growth, development and maturation of neurons in the brain. BDNF is responsible for the neuronal differentiation and plasticity in the nervous system. The involvement of BDNF is well studied phenomenon in many psychiatric disorders e.g Alzhiemers Disease, Huntington's Disease and Bipolar Disorder. Serum Brain Derived Neurotrophic Factor and Gene mutation in Autism spectrum disorders, is a DBT approved project, carried out at the Dept. Of Biochemistry to investigate the role of BDNF, if any, in the pathogenesis of Autism Spectrum Disorders. A functional Single Nucleotide polymorphism (SNP), G196A which changes the amino acid Valine at the 66th position of the protein to Methionine is the most studied polymorphism in the *BDNF* Gene. This and other SNPs along with the epigenetics involved in the *BDNF* Gene will be studied under this project. Characterization of two SNPs in BDNF gene using ARMS PCR has been completed.



G allele= 253 bp: A allele = 201bp control = 401 bp

Figure 1: Agarose gel electrophoresis of ARMS-PCR fragments to detect single nucleotide polymorphisms in the BDNF gene. Primers have been designed to the SNP region of the BDNF gene so that they yield a 253 bp fragment represents the “G” allele and 201 bp fragment represents the “A” allele.

Samples	Genotype	Phenotype
HA1, HA2, AF-6, AF-3, MR-79, MR-83, AF-7, AF-M, AF-13, AF-AS, ASD-1, AF-10, AF-1, MR-5, MR-52, MR-3, MR-58, MR-72, MR-105, MR-4, MR-7, MR-114, MR-95, MR-54, MR-113	G/G	Valine/Valine
AF-HAF-3, AF-2, AF-9, AF-8, MR-8	G/A	Valine/Methionine

Table 1: Summary of the genotypes of 31 patients analyzed till now

28. Role of Inflammation in Type 2 diabetes

Investigator	Ms. Gauri Patade
Guide	Dr. Rosalind Marita
Co-guide/mentor	

The aim of this research is to understand the role of adipose tissue macrophages in type 2 diabetes. We wish to understand the mechanisms by which macrophages affect the function of the adipose tissue and affect glucose homeostasis. Two distinct subsets of macrophages viz M1 and M2 are present in adipose tissues. The M1 macrophages are proinflammatory whereas the M2 macrophages are anti-inflammatory. The M1 phenotype represents the classically activated macrophages and is characterized by increased expression of cytokines such as TNF- α , IL-1 β and IL-6. These cytokines inhibit insulin action in the adipose tissues and contribute to insulin resistance. The M2 phenotype represents alternative activation and is associated with anti-inflammatory cytokines such as IL-10, IL-4, and TGF- β . M2 macrophages help in maintaining tissue homeostasis and insulin sensitivity. The shift from M2 to M1 phenotype could be a contributing factor in the development of insulin resistance and ultimately to Type 2 diabetes. To our knowledge, studies on macrophages in type 2 diabetes patients are limited. Thus, there is a need to understand the role of inflammation and the contribution of these adipose tissue macrophages subpopulations in the pathogenesis of type 2 diabetes in humans. We hope that the results obtained can provide new insights into the pathogenesis of the disease in Indian subjects.

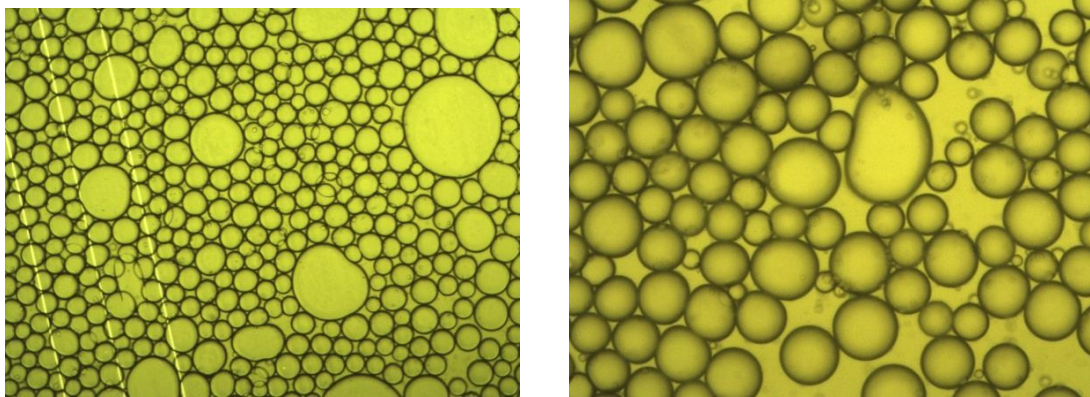


Figure 1: Adipocytes isolated from biopsies of adipose tissue (left) 5X magnification (Right) 10X magnification

ON-GOING PROJECTS

MSC PROJECTS

1. Evaluation of Neuro-inflammation due to Different Dengue Virus Serotypes

Investigator	Rushil S Bhatt
Guide	Dr. Sweta T Kothari
Co-guide/mentor	Dr. Abhay Chowdhary

Dengue viruses are group B togaviruses that form a complex of four closely related antigenic types (types 1 to 4). Each of the four virus types can be transmitted by infected mosquito vectors (*Aedes aegypti* or *Aedes albopictus*) to man, where they often cause a self-limiting, febrile disease. Locations endemic for dengue virus infection often harbour two or more dengue types resulting in individual hosts (man or mosquito) being exposed to, and possibly becoming infected with, multiple dengue virus types. The biology of co-infection with two dengue virus types in either of these hosts is, however, poorly understood.

Dengue encephalitis is one of the more severe outcomes in the infection, wherein the virus goes and invades the neuronal cells. This is associated with a high degree of morbidity and mortality. Secondary infection with a serotype different from that of the primary infection leads to DHF/DSS. Moreover, studies are necessary to understand the differential virulence with respect to serotypes in Dengue.

We therefore envisage an in-vitro study to evaluate the differential virulence of the Dengue serotypes as this would be more convenient and ethical than using mouse models as a preliminary set-up. This will open a new dimension in the understanding of the neuro-pathogenesis of “Indian” serotypes of dengue virus, which in turn would help in alleviating the morbidity and mortality due to Dengue associated complications.

2. The study of differential expression of matrix metalloproteinase genes in macrophage infected with *Mycobacterium tuberculosis*

Investigator	Mr. Jinesh Maniar
Guide	Dr. Shashikant Vaidya
Co-guide/mentor	

Tuberculosis (TB) is a bacterial infectious disease caused by obligate human pathogen *Mycobacterium tuberculosis*. Tuberculosis (TB), one of the oldest recorded human disease, is still one of the biggest killers among the infectious diseases, despite the worldwide use of a live attenuated vaccine and several antibiotics. Infection spreads primarily by the respiratory route directly from an infected person who discharges live bacilli into the air. The bacilli are then trapped in the tissues of the body, are surrounded by immune cells, and finally are sealed up in hard, nodular tubercles. In some cases, the original tubercles break down, releasing viable bacilli into the bloodstream. This causes a condition known as pulmonary tuberculosis, a highly infectious stage of the disease. The primary infection may spread through the body, causing miliary tuberculosis. In fact, once the bacilli enter the bloodstream, they can travel to almost any organ of the body, including the lymph nodes, bones and joints, skin, intestines, genital organs, kidneys, and bladder. Although the bacilli can spread to various organs of the body, its exhibit exhibits marked variations with respect to the pathological manifestations.

The macrophage is the main replication niche of MTB, despite the bactericidal characteristics and functions that this cell type normally has. MTB interacts with the macrophage through several different receptors. During infection, their role is to ingest and destroy pathogens, recruit other cells of the immune system, and present antigens from the microbe to cells of the adaptive immune system. Therefore it will be of great importance to assess the differential responses with respect to matrix metalloproteinases gene expression in resident macrophages of various organs when infected with *mycobacterium tuberculosis*. This study will analyse these differential response in Microglia, Alveolar and Circulating blood macrophages when infected with MTB *in vitro*.

3. Comparative Analysis of Different Molecular Methods for Diagnosis of Multi- Drug Resistant Tuberculosis

Investigator	Mr. Jayshankar Sharma
Guide	Dr. Shashikant Vaidya
Co-guide/mentor	

Tuberculosis is one of the leading infectious diseases in the world and is responsible for more than 2 million deaths and 8 million new cases annually. Because of the slow growth rate of the causative agent *Mycobacterium tuberculosis*, isolation, identification, and drug susceptibility testing of this organism and other clinically important mycobacteria can take several weeks or longer. During the past several years, many molecular methods have been developed for direct detection, species identification, and drug susceptibility testing of mycobacteria. These methods can potentially reduce the diagnostic time from weeks to days. These assays are rapid and offer high sensitivities and specificities. The study expects to perform a comparative analysis between different molecular methods of Multi Drug Resistant tuberculosis diagnosis and produce an algorithm which might help in implementation of newer protocols in the diagnosis of Multi Drug Resistant tuberculosis.

4. Characterization and assessment of antimicrobial and antioxidant activity of Kombucha

Investigator	Ms. Tehmeena Mukaddam
Guide	Dr. Sunita Deshpande
Co-guide/mentor	

Kombucha is a refreshing beverage obtained by the fermentation of sugared tea with a symbiotic culture of acetic acid bacteria and fungi. The focus of this study is to investigate the antimicrobial and antioxidant activity of kombucha and chemical characterization of fermented kombucha. Organisms in the symbiotic culture used for fermentation, will be isolated and identified using biochemical and molecular techniques. Antimicrobial activity of kombucha tea will be assessed against various Gram positive (*Staphylococcus aureus*,) Gram negative bacteria (*Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella*) and fungus (*Candida albicans*). Chemical characterization of the system will be carried out using chromatographic techniques, for estimating the levels of sugars, organic acids and ethanol. Antioxidant activity will be assessed by FRAP assay.

5. Synthesis of some Quinoline Derivative as potent Anti-Microbial agents

Investigator	Mr. Gaurav H. Desai
Guide	Dr. Anil S Bobade
Co-guide/mentor	Mr. Ashish L Asrondkar

Medicinal chemistry is the science that deals with the discovery and design of new therapeutic chemicals and their development into useful medicines. Medicinal chemistry is concern with the organic, biological and analytical aspects of this process. Thus it occupies a strategic position at the interface of chemistry and biology. Based on these aspects, efforts have been made to synthesize molecules with incorporation of various substituents with active moieties such as 8-Hydroxy Quinoline.

Quinoline derivatives have been well known not only in medicinal chemistry, because of their wide occurrence in natural products and drugs. 8- Hydroxy Quinoline and their derivatives are important constituents of biologically active. Synthetic compounds, as several derivatives of this heterocyclic unit have been found to possess useful biological activities such anti-malarial, anticancer, anti-viral, anti-HIV, anti-microbial agents. 8- Hydroxy Quinoline family compounds are widely used as a potent compound to make drug.

6. Synthesis and characterization of Nalbuphine derivatives

Investigator	Mr. Sanjeev Patil
Guide	Dr. Anil S Bobade
Co-guide/mentor	Mr. Ashish L Asrondkar

Nalbuphine HCl is developed by Blumberg: Endo laboratories in 1967. Product patents US 3332950. Nalbuphine HCl is the drug in a class of compound known as semi-synthetic opioid used commercially as analgesic under a variety of trade names. It is sold by under trade name Nabain.

Heterocyclic organic compounds like phenanthrene, triazole, oxadiazole, etc shows promising biological activities. Literature survey shows following highlights, Phenanthrene derivatives' are an interesting group of compounds and biological activities of this class of compound that are prepared in literature are analgesic, opioid antagonist activity.

7. Synthesis and comparative study of novel thiophene associated 1, 3, 4-thiadiazole derivatives as a potential pharmacological agents

Investigator	Mr. Shouvik Debnath
Guide	Dr. Anil S Bobade
Co-guide/mentor	Mr. Sushant Kaple

Amongst the various biologically significant compounds those proved to be useful for mankind, the heterocyclic compounds have major share. There are large number of pharmacologically active derivatives of thiadiazole, thiophene, thiazoles, imidazoles, Benzimidazoles, triazoles, etc. which have activities such as anti-inflammatory, antibacterial, antifungal, antipyretic, antipsychotic, etc

So here, in the scheme, two suitable moieties i.e., of thiophene associated 1,3,4-thiadiazol-2-amine is selected & it is treated with various substituted acetophenone & benzaldehyde to produce Schiff bases of possible bioactivities & further the bioactivities are to be compared between the two groups of molecule. Similarly, in next step also the above mentioned two moieties are selected and various substituted indazole rings are formed over the two. Further these two groups of indazole derivatives will be checked for pharmacological activities & the activities will be compared between the two groups.

All the synthesized compounds will be confirmed by spectral analysis such as IR & NMR for structure confirmation and then only they are going to be screened for various pharmacological activities such as antibacterial, antifungal, anti-inflammatory, etc.

8. Comparative Analyses of Different Methods for the Diagnosis of Malaria

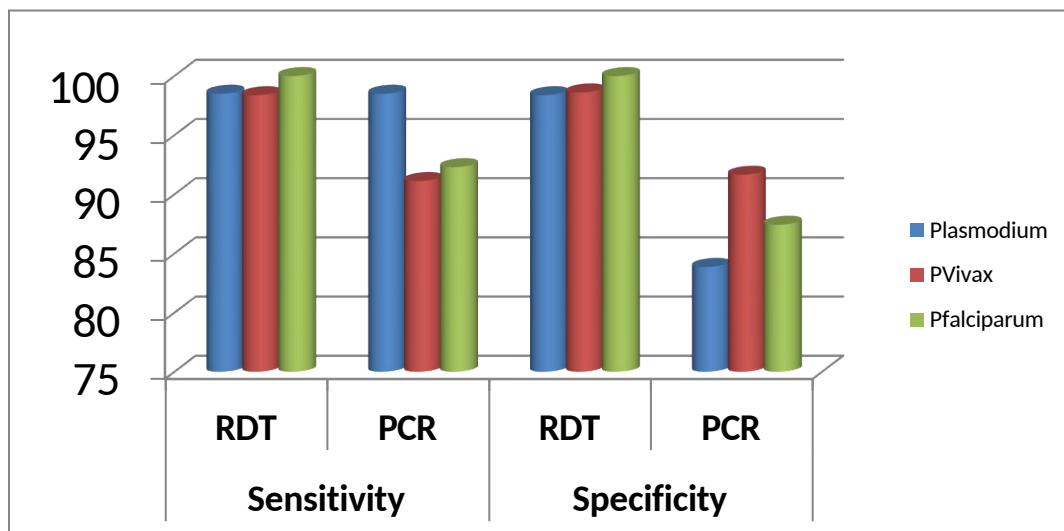
Investigator	Mr. Paras Mahale
Guide	Dr. Mira Ramaiya
Co-guide/mentor	Dr. Abhay Chowdhary

A proper diagnosis of Malaria is the major issue in the endemic countries. As it becomes the first step in Malaria Elimination Strategy, it presents a challenge to laboratories. Timely diagnosis of malaria helps in the initiation of anti-Malarial therapy, thus reducing the severity of the illness. Conventional diagnosis method raises serious difficulties in weak health systems. Delay in treatment may lead to serious consequences. To tackle these important problems there is an obvious need for better implementation of our current methods. Sensitive, specific and rapid diagnosis of malaria is the need of the hour. This is critical to malaria diagnosis especially in the developing countries. Since various methods are employing various principles a definitive co-relation between the techniques is needed. The present study is considered to identify the best possible methodology in the detection and diagnosis of malaria.

The sample size carried out was 196 blood samples from clinically suspected malaria patients. In case of ELISA, only 156 samples were processed.

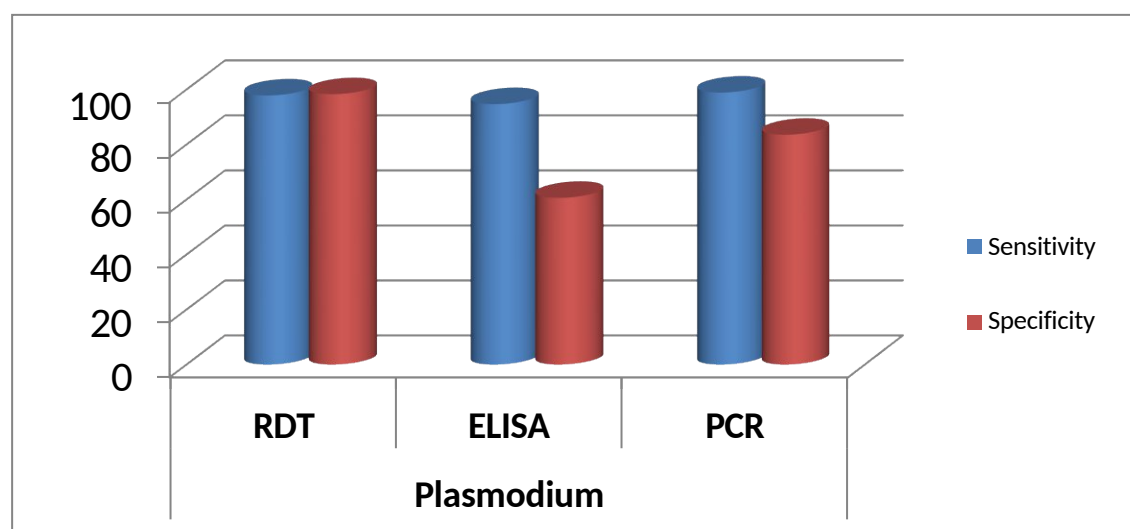
Sensitivity and Specificity of RDT and PCR, considering Gold Standard as Microscopy
(Data has been analyzed for 196 samples and ELISA is not included)

Gold Standard Microscopy	Sensitivity %		Specificity %	
	RDT	PCR	RDT	PCR
<i>Plasmodium spp.</i>	98.5	98.5	98.38	83.87
<i>P. vivax</i>	98.38	91.12	98.61	91.66
<i>P. falciparum</i>	100	92.3	100	87.43



Sensitivity and Specificity of RDT, ELISA and PCR, considering Gold Standard as Microscopy
(Data has been analyzed for 156 samples)

Gold Standard Microscopy	<i>Plasmodium</i>		
	RDT	ELISA	PCR
Sensitivity	97.89	94.73	98.94
Specificity	98.36	60.65	83.6



To conclude, Rapid detection techniques as well as microscopy are crucial techniques as they offer diagnosis at point-of-care facilities. Serology and RDT use the same target for detection as well as the same chemistry for generating the analytical signals. However the positivity (sensitivity) of ELISA is much greater than RDT. Newer and improved methods for performing RDT must be employed. The nested PCR was more reliable allowing the detection of *Plasmodium* in cases with low parasitemia, as well as with mixed infections of malaria. The sensitivity and the specificity of nested PCR were as significant as RDT, while considering Microscopy as Gold standard. In all instances, there were few specimens that were PCR and ELISA positive and microscopy negative was collected from clinically suspected patients. Inconsistency in microscopy based laboratory diagnosis is increasing due to the lack of fiscal and personnel investments needed to maintain and improve the laboratory identification of *Plasmodium* species. RDT may consider as primary detection technique, where laboratory facilities are not available. ELISA and PCR may therefore also be used as a high throughput screening technique and employed in prevalence studies on parasites in a given geographical region. PCR is a valuable confirmatory test and implementation should be considered by reference laboratories and worldwide with adequate laboratory infrastructure to perform molecular procedures. Further analyses involving larger number of samples is critical for presenting the true picture of the scenario.

9. Insecticide resistant gene diversity in mosquito larvae

Investigator	Ms. Raksha Shinde
Guide	Dr. Mira Ramaiya
Co-guide/mentor	Dr. Abhay Chowdhary

Resistance to insecticides has appeared in major insect vectors. Current mosquito control efforts are heavily dependent on a single class of insecticide, the pyrethroids, which are the most commonly used compounds. The major target site for pyrethroids is voltage gated sodium channel. The emergence of newer insecticide resistant mosquitoes increases the risk of mosquito borne illnesses. The present study was therefore designed to evaluate insecticide resistance of mosquito population around Mumbai region and to understand the underlying mechanisms of such events (insecticide resistance). As a part of the study, mosquitoes of different species collected from Mumbai region, were exposed to the various concentration of insecticides (Permethrin and Deltamethrin) as per standard protocol. The study exhibited 20% resistance in Anopheles larvae against permethrin(1ppm), 70-90% resistance in Culex adult against both Permethrin(1ppm,10ppm)and deltamethrin(1ppm,10ppm) and 100% sensitivity in Culex larvae against permethrin(0.1ppm,1ppm,10ppm), the mean percent mortality was calculated using Abbott's formula(WHO/VBC/81.807) . Further DNA was extracted and voltage gated sodium channel gene was amplified using specific primers, further the samples were sequenced to identify specific mutations. A constant surveillance of such emerging pattern becomes imperative in the present day situation; to plan and select appropriate alternative control measures or insecticide for effective control.

Insecticide	Species	Stage	0.1ppm	1ppm	10ppm
Permethrin	Culex	Adult	100%	12%	0%
		Larvae	0%	0%	0%
	Aedes	Adult	20%	16%	8%
		Larvae	20%	0%	0%
	Anopheles	Larvae	24%	20%	0%
Deltamethrin	Culex	Adult	100%	100%	20%
		Larvae	4%	4%	4%
	Aedes	Adult	100%	40%	0%
		Larvae	16%	12%	0%
	Anopheles	Larvae	20%	0%	0%

ON-GOING PROJECTS : SHORT TERM RESEARCH INTERNSHIP PROGRAMME

1. Role of oxidative stress in HIV infection

Investigator	Ms. Nupur Deshpande
Name of college	Vellore Institute of Technology, Vellore.
Guide	Dr. Abhay Chowdhary /Dr. Mira Ramaiya
Co-guide / mentor	Sahil Kulkarni

The immunodominant region of the Japanese Encephalitis Virus namely Domain 3 (as identified earlier), is extracted from the earlier chosen bacterial cloning vector namely pJet. Once extracted, the mammalian expression vector pVac was chosen having a signal sequence of IL-2. This vector was chosen due to its earlier proven efficiency of being used to develop recombinant vaccines.

The genome sequence of the plasmid was identified and primers pertaining to the Multiple Cloning Site were designed. As per the results obtained, pVac was restricted using suitable restriction enzymes, in this case, being ECoR1 and BAMH1.

Once done, the restricted Domain 3 was ligated into the restricted pVac, using the T4 DNA Ligase enzyme obtained in suitable kits.

The artificial plasmid pVac containing the immunodominant region Domain 3 was then transformed into suitable media plates containing the appropriate antibiotic. The antibiotic was chosen depending on the antibody resistant site in the vector, in this case, being Zeomycin. Hence, transformation was done on LB plates containing the antibody Zeomycin. Culturing of LLC-MK2 and BHK cells in suitable culture flasks and 6-well plate for further experiments.

2. Establishment of JE infection on a suitable cell line and anti viral activity of Progesterone against Japanese Encephalitis

Investigator	Mr. Sushant Karnik
Name of college	Dr. D Y Patil College of Biotechnology, Belapur, Navi Mumbai
Guide	Dr. Abhay Chowdhary /Dr. Mira Ramaiya
Co-guide / mentor	Sahil Kulkarni

The expression of pVac into Domain 3 carried out earlier will be studied using Western Blot and PAGE by using standardisation techniques. It will also be inoculated in mice and blood will be collected to check the antibody titre.

Further culturing of LLC-MK2 and BHK cells was carried out in suitable culture flasks and 6 well plates.

Once the cell line shows appropriate confluency in flasks and plates, JEV will be inoculated into the 6 well plates for it to show infection against the LLC-MK2 and BHK cells. Several passages of the same shall be carried so as to enable acclimatisation of the virus on the above mentioned cell lines.

Once done, Progesterone in appropriate concentration shall be inoculated into the JEV infected 6-well plates so as to test its antiviral activity against Japanese Encephalitis. The inoculation shall be done in the following three ways

- Pre Infection.
- Immediately post infection.
- A while after the cells are infected by Japanese Encephalitis virus.

3. Study of iron and copper metabolism in experimental murine malaria

Investigator	Ms.Chandni Bhanushali
Name of college	Dr. D.Y Patil College of biotechnology, Belapur, Navi Mumbai
Guide	Dr. Abhay Chowdhary /Dr. Mira Ramaiya
Co-guide / mentor	Mansi Malik

Oxidative stress and thus the resulting metal overload leads to the pathology of malaria. Parasite feeds on haemoglobin leading to iron overload and also interfering in the copper metabolism of the host.

In this study parasitaemia was induced by inoculating C57 BL/6 mice intraperitoneally with *Plasmodium berghei*.

The copper binding gene ceruloplasmin was quantified with respect to gene expression by Real Time PCR and protein expression by means of Western Blotting.

Also the iron binding gene Transferrin was quantified with respect to gene expression by Real Time PCR and resulting protein expression by Western blotting.

The correlation of iron and copper pathways was thus established by analyzing the results obtained. The study helps in understanding the gene as well as protein expression of iron and copper binding elements in severe murine malaria.

4. evaluation of metallothionein iso forms and gamma glutamyl transferase in experimental murine Malaria

Investigator	Ms. Disha Aggarwal
Name of college	Dr. D.Y Patil College of biotechnology, Belapur, Navi Mumbai
Guide	Dr. Abhay Chowdhary /Dr. Mira Ramaiya
Co-guide / mentor	Mansi Malik

Metallothionein is an inducible gene which is expressed due to resulting metal overload due to oxidative stress in malaria.

In this study parasitaemia was induced by inoculating C57 BL/6 mice intraperitoneally with *Plasmodium berghei*

Metallothionein isoforms I, II and III was quantified with respect to gene expression by Real time PCR and protein expression by means of Western Blotting.

Gamma glutamyl transferase is amagnesium responsible gene.It is expressed due to magnesium availability in the cellular mileu.

Gamma Glutamyl Transferase gene and protein expression was quantified by Real Time PCR and Western blot respectively.

The study focuses on gene and protein expression of metallothionein isoforms,zinc responsive elements as well as gamma glutamyl transferase the magnesium responsive element in severe malaria.

5. Role of oxidative stress in HIV infection

Investigator	Mr. Gauri Shinde
Name of college	
Guide	Dr. Suchita Dandekar
Co-guide / mentor	Mr. Shreewardhan Rajopadhye

Both viral and host factors are responsible for oxidative stress in HIV disease, which in turn activates the replication of HIV provirus by various pathways. Oxidizing stress is a pathologic phenomenon resulting from imbalance between the system producing active oxygen species and those defending the organism. The study focus on the role of redox cycles which involves the enzymes such as catalase, SOD, GST, small molecules such as glutathione, protein thiols. The study focus on how these molecules plays role oxidation-reduction chemistry which leads to the oxidative stress in the disease condition. 30 HIV positive and 30 healthy controls have been included in the study. The oxidative stress parameters measured from the serum samples from the patients. This study will help us to understand how the redox cycle pathways plays the role to increase the oxidative stress in the HIV infection and which leads to disease progression and leads to the death of the individuals.

6. Study of Adipocytes in Surgical samples and expression levels of 3 Diabetes - Obesity associated genes

Investigator	Mr. Akshat Porwal
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Name of college	
Guide	Dr. Rosalind Marita
Co-guide / mentor	Ms. Gauri Patade

Obesity is the epidemic of the 21st continues to rise century. The World Health Organization estimates that globally there are >1 Billion overweight adults [(BMI; in kg/m² > 27], 300 million of whom are obese (BMI>30). Obesity associated chronic tissue inflammation is a key contributing factor to Type 2 Diabetes and Cardiovascular Disease. Areas of active investigation focus on the molecular bases of metabolic inflammation and potential pathogenic roles of Insulin Resistance leading to diabetes and CVD. In India, the scenario presents certain alarming facts about obesity and diabetes patients. Traditionally known for malnutrition, Indians now report more and more frequently with overweight, obesity, and their consequences. They exhibit unique features of obesity: Excess body fat, abdominal adiposity, increased subcutaneous and intra-abdominal fat, and deposition of fat in ectopic sites (such as liver, muscle, and others). The rising prevalence of these lifestyle disorders such as Diabetes, obesity, hypertension, dyslipidemia in India is of concern as singly or in combination, which act as major risk factors for coronary artery diseases (CAD). This study focuses on Isolation of Adipocytes from human visceral fat samples, Triglyceride and Protein estimation from the isolated adipocytes, mRNA expression in visceral adipose tissue of the following obesity associated genes: PPAR-gamma, FTO, and TCF7L2. Immunohistochemical staining of the mature adipocytes. Similarly correlating the collected data with the basic parameters of age, sex, BMI, diabetes status, etc. In developing countries, the prevalence of obesity.

7. Role of oxidative stress in HIV infection

Investigator	Ms. Gauri Shinde
Name of college	
Guide	Dr. Suchita Dandekar
Co-guide / mentor	Mr. Shreewardhan Rajopadhye

Both viral and host factors are responsible for oxidative stress in HIV disease, which in turn activates the replication of HIV provirus by various pathways. Oxidizing stress is a pathologic phenomenon resulting from imbalance between the system producing active oxygen species and those defending the organism. The study focus on the role of redox cycles which involves the enzymes such as catalase, SOD, GST, small molecules such as glutathione, protein thiols. The study focus on how these molecules plays role oxidation-reduction chemistry which leads to the oxidative stress in the disease condition. 30 HIV positive and 30 healthy controls have been included in the study. The oxidative stress parameters measured from the serum samples from the patients. This study will help us to understand how the redox cycle pathways plays the role to increase the oxidative stress in the HIV infection and which leads to disease progression and leads to the death of the individuals.

8. To Study the Antibiotic susceptibility, biofilm formation and plasmid profiling in *Pseudomonas aeruginosa* isolated from burns patients

Investigator	Ms. Kashmira Davane
Name of college	
Guide	Dr. Abhay Chowdhary
Co-guide / mentor	Mr. Rohan Dudhale/Mr. Vivek Vishwe

Pseudomonas aeruginosa have an ability to produce the Biofilm and create major problem i.e. antibiotic resistance and these antibiotic resistance genes can be transfer by horizontal gene transfer (HGT). The plasmid carries such genetic traits, hence to isolate and identify the plasmid & there genes they carry.

In this study we carried out collection of 50 *Pseudomonas aeruginosa* isolated from burns patients. Perform their Biofilm formation as well as AST. Looking forward to isolate the plasmid and it's profiling.

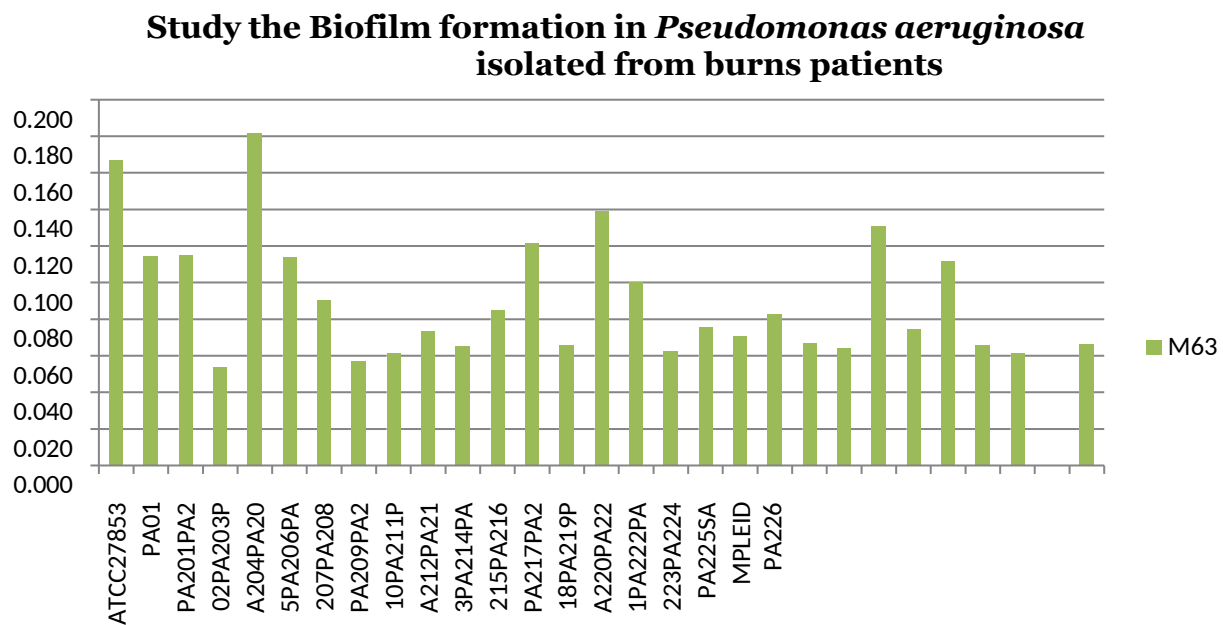


Figure 1: Biofilm formation in *Pseudomonas aeruginosa* compare with standard ATCC 27853 and PAO1 Strain.

9. Role of Histamine Pathway in the Prognosis of Rabies in Murine Model

Investigator	Mr. Ajinkya Avinash Deshpande
Name of college	
Guide	Dr. Abhay Chowdhary
Co-guide / mentor	Mr. Sandeepan Mukherjee

Histamine is a monoamine neurotransmitter that is primarily involved with the regulation of Circadian Rhythms in mammals. In the CNS, histamine is solely synthesized in the neurons of tuber cinereum of the hypothalamus. The activity of histamine is coordinated by the H1 and H3 histamine receptors. Since somnolence is frequently observed in rabies, especially the paralytic form, the present study shall determine the role of histamine pathway in the prognosis of rabies in Cerebrum, Cerebellum and the Spinal cords of Mice infected with Rabies Virus.

10. Interplay of Tryptophan Metabolism in the Prognosis of Rabies in Murine Model

Investigator	Mr. Yash Manish Karia
Name of college	
Guide	Dr. Abhay Chowdhary
Co-guide / mentor	Mr. Sandeepan Mukherjee

The amino acid Tryptophan (Trp) is an important metabolite which constitutes immensely in maintaining the CNS and immune homeostasis in mammals. Two major metabolic pathways that emerge out from Trp are the Serotonin pathway and the Kynurenine pathway. While the former is controlled by the activity of the enzyme Tryptophan Hydroxylase (TPH) the later is regulated by Indoleamine 2, 3-dioxygenase (IDO). Serotonin is an important neurotransmitter which functions in regulating the diurnal rhythms, cognition, mood, attention and emotions. Kynurenine and its downstream metabolites – Kynurenic Acid, Anthranilic Acid and Quinolinic Acid are important neuro and immunomodulators. The present study is undertaken to assess the interplay of various tryptophan metabolites in Cerebrum, Cerebellum and the Spinal cords of Mice infected with Rabies Virus.

11. Assessment of Dopaminergic Pathway in the Prognosis of Rabies in Murine Model

Investigator	Ms. Priyanka Shivagouda Naik
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Name of college

Guide	Dr. Abhay Chowdhary
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Co-guide / mentor	Mr. Sandeepan Mukherjee
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The Dopaminergic neurotransmission system is a pivotal pathway which controls motor functions, emotions, memory and reward mechanisms in mammals. The dopaminergic systems function in four distinct paths, namely the mesocortical, the mesolimbic, the nigrostriatal and the tuberoinfundibular pathway. These pathways are coordinated by via Dopamine Receptors that are present in the CNS and the periphery. Two distinct sets of receptors mediate the actions, the D1 like consist of the D1 and D5 receptors and are excitatory in nature, whereas the D2 like consists of D2, D3 and D4 receptors and are inhibitory in nature. Neuromotor dysfunction is a cardinal manifestation in Rabies encephalitis. The present study is envisaged to study the role of Dopaminergic pathways in the Cerebrum, Cerebellum and the Spinal cords of Mice infected with Rabies Virus.

ON-GOING PROJECTS : INSTITUTIONAL/EXTERNALLY FUNDED PROJECTS

1. Design, Synthesis and Evaluation of Novel Neuraminidase Inhibitors in Treatment of Influenza (H5N1/H1N1)

Investigator	Dr. Sweta T Kothari, Dr. Meena Kanyalkar
Guide	Dr. Abhay Chowdhary
Funding Agency	Haffkine Institute, Kundnani College of Pharmacy

Influenza, the most alarming pandemic threat that can turn into lethal epidemic, is caused due to H5N1/H1N1 virus. The life cycle of influenza virus provides several potential targets for drug intervention. Among those Neuraminidase (NA) is of particular importance as it is responsible for viral release and progression of the disease. Structure based drug design methods have played critical role in discovery of its inhibitors such as Oseltamivir and Zanamivir. But emergence of resistant strain to Oseltamivir necessitates the development of new and effective neuraminidase inhibitors using alternative approaches. We have focused our research on design and synthesis of novel compounds as neuraminidase inhibitors.

Major Breakthrough of the Project

- We have identified about 16 compounds that inhibit the Neuraminidase enzyme of Influenza virus in a non-competitive manner, with the IC₅₀ comparable to Oseltamivir.
 - These compounds may be further screened and taken up as drug candidates in our fight against Influenza epidemics.
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2. Prophylactic and Therapeutic Effect of Virgin Coconut Oil and Omega Three Rich Vegetable Oil Blends on Neuro-Inflammation

Investigator	Dr. Sweta T Kothari, Dr. Subhadra Mandalika
Guide	Dr. Abhay Chowdhary
Funding Agency	Haffkine Institute, Nirmala Niketan College of Home Science

Coconut oil is composed of 92% saturated fat out of which over 50% is medium chain triglycerides composed of fatty acids chain length 8 to 12. Coconut oil is devoid of one of the essential fatty acids i.e. omega 3 fatty acids. Beneficial role of consumption of omega three fatty acids in inflammation is well established, particularly in rheumatoid arthritis. High dietary consumption of omega 3 fatty acids has shown to reduce MPTP neurotoxin (1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine) induced decrease in dopamine in animal models. Also, omega 3 fatty acids share a reciprocal relationship with saturated fatty acids in modulating pattern recognition receptors (PPR) mediated inflammation by inhibiting PPRs including toll like receptors (TLRs). Hence we propose to blend virgin coconut oil along with vegetable oils rich in omega 3 fatty acids and observe its preventive as well as therapeutic effect on neuro-inflammation.

Major breakthrough of the project

- We have completed the emulsification of oils and Cytotoxicity studies of the individual oils and their blends in a cell culture model.
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3. Studies on Neuronal Proteomics, Virus-Host Interaction and Immune-Pathological Alterations in Rabies Encephalitis in Murine Model

Investigator	DR. ABHAY CHOWDHARY
Co-investigators	Dr. S. Madhusudhana, NIMHANS; Dr. Akhilesh Pandey & Dr. T.S. Keshava Prasad, IOB.
Funding Agency	Department of Biotechnology, Government of India

The study is based on enhancing the knowledge on pathophysiological basis of neurological infections causing encephalitis with emphasis on rabies. It is intended to fill the gaps that are left in the overall comprehension of the immunopathogenesis of rabies and the current therapeutic options available for the management of rabies. Although vaccine preventable, rabies is left with no treatment once the clinical signs and symptoms of the disease appear. The mechanism of classical symptoms and inevitable death is still poorly understood. As there is no marked neuronal lysis and apparent pathological findings, focus is now mainly towards understanding the mechanisms that lead to profound neuronal dysfunction that may result from alteration in neuronal metabolism involving synthesis of neuronal proteins including neurotransmitters. Some earlier studies suggested probable deficiency of acetyl choline, serotonin and over production of GABA. Our study hopes to glean better understanding of rabies virus infection focusing on these aspects coupled with host factors and immune response elicited during disease progression. We hope that understanding these mechanisms may give some leads to formulate specific therapeutic measures to otherwise a fatal disease. We propose to carry out quantitative proteomic profiling to identify gene expression levels associated with rabies in rabies virus infected mouse brain. We also aim to identify proteins, which are associated with the viral infection by quantitative proteomics. In order to accomplish this, we will carry out a quantitative proteomic profiling of rabies infected mouse brain and normal mouse brain. We will also perform proteomic profiling of mouse brain tissues, which are challenged with various rabies strains. This proteomic approach will be achieved by *in vitro* labeling using iTRAQ technology followed by liquid chromatography and high resolution tandem mass spectrometry (LC-MS/MS). An important goal of this proposal is to identify proteins that are differentially regulated in rabies.

4. Mechanism Based Screening and Validation of Herbal Drugs Using Radiotracer Techniques

Investigator	Dr. Abhay Chowdhary
Co-investigators	Dr. R. D. Lele, Dr. H. S. Palep, Dr. Tarala Nandedkar, Dr. N. Sivaprasad
Funding Agency	Department of Science & Technology, Government of India

Based on experiential wisdom of over 5000 years, Ayurveda has described 50 categories of drugs with their clinical indications. Using current understanding of molecular biology, the antioxidant, anti-inflammatory and immunomodulatory actions of many Ayurvedic herbal drugs have been established. A classical example is Curcumin (active principle of haldi), which prevents NF- κ B activation via COX, LOX and induces apoptosis.

Ayurveda describes 12 “Medhya Rasayanas”—Memory enhancing drugs which need validation using the transgenic mouse model of Alzheimer’s Disease (AD) which is now commercially available. These mice are normal at birth and within 4 months, they develop all the pathological changes in human AD, which can be studied by in vivo imaging, without killing the animals. We plan to study the potential of Ayurvedic herbal drugs for prevention as well as reversal of established diseases. The importance of this project can be appreciated by the fact that today there is no effective drug for AD yet. US\$15 billion are being spent by patients to buy drugs for AD. If our mission validates Medhya Rasayans, a world market of \$15 billion for this simple disease awaits us. The world market of herbal drugs is over \$100 billion of which Chinese share is 57%. India’s share is a mere 2%. Hence, the importance of supporting our project.

5. Identification of Extended Spectrum β - Lactamases (ESBL's) and Metallo β - Lactamases (MBL's) in Clinical Isolates

Investigator	Dr. Abhay Chowdhary
Co-investigators	Dr. Shashikant Vaidya
Research Fellows	Mr. Omkar Lele, Mr. Jaishankar Sharma
Funding Agency	Haffkine Institute

Antibiotic resistance is an important issue affecting public health, and rapid detection in clinical laboratories is essential for the prompt recognition of antimicrobial-resistant organisms. Infection-control practitioners and clinicians need the clinical laboratory to rapidly identify and characterize different types of resistant bacteria efficiently to minimize the spread of these bacteria and help to select more appropriate antibiotics. This is particularly true for ESBL-producing bacteria. The epidemiology of ESBL-producing bacteria is becoming more complex with increasingly blurred boundaries between hospitals and the community.

Accurate detection of Extended-Spectrum Beta-Lactamases (ESBLs) among *Enterobacteriaceae*, *Pseudomonas sp.*, *Acinetobacter sp.* etc has been a focal point for many clinicians and laboratorians lately. Extended-spectrum beta-lactamases- (ESBL's)-producing Gram Negative Bacilli (GNB) are an increasingly significant cause of community-acquired infection worldwide. Current study focuses on assessment of presence ESBL-in GNB and also analyzes the relationship between antimicrobial susceptibility profiles to presence of NDM-1 gene in these isolates.

In the present study we shall perform the screening by the disc diffusion tests which are recommended by the Clinical and Laboratory Standards Institute (CLSI). ESBL types and NDM-1 genes will be detected by PCR technique. Since there is limited data available on the prevalence of ESBL among pathogens and absolutely no data available regarding production of NDM-1 by pathogens in this region the current study is extremely important to assess rampant multi-drug resistance shown by GNB in this region.

Major breakthroughs of the Project

- ESBL producing bacteria were identified by phenotypic methods like Double Disk Synergy Test and Confirmatory Test.
 - Identification of MBL's by Imipenem and Meropenem drug susceptibility was done.
-

6. Preparation of EMTACT Nosode and to Evaluate the response of Emtact Nosode on Immune System using *In Vivo* Study

Principal Investigators	Dr. Rajesh Shah, Dr. Abhay Chowdhary
Site Investigators	Dr. Shashikant Vaidya
Coordinators	Mr. Sandeepan Mukherjee, Miss. Suvarna Joshi, Mrs. Geeta Talele
Research Fellows	Mr. Jaishankar Sharma
Funding Agency	Life Force Homeopathic Research Institute

Nosodes are vaccine-like homeopathic medicines prepared using clinical sample and applying homeopathic manufacturing practices. A wide range of nosodes has been in use by the homeopathic fraternity ever since 1810. Various nosodes have been found effective in many infectious diseases as well as non-infectious diseases. Nosodes are used as preventive as well as therapeutic measure. For instance, current Tuberculinum nosode is used to treat opportunistic infections, frequent colds, recurrent Upper and Lower Respiratory tract infections, etc. The scientific approach would be to find out the *modus operandi* of the action at cellular and immunological level.

The hypothesis is that any significant improvement in Recurrent Upper and Lower Respiratory Infections must reflect in some measurable immunological parameters. We will try to examine various possible immunological markers through cytokine expression which may be indicative of post medication improved immune status, which include pro-inflammatory and anti-inflammatory cytokines and T-cell proliferation. The study shall give us important immunological (Cytokine Gene Expression) and Pathological (Histology) correlates of administration of Tuberculinum in Normal and induced immune-compromised mice. This shall throw lights on the tentative mechanism of action of this preparation.

Major breakthrough of the project:

- Polyvalent Mycobacterium Tuberculosis Nosode is prepared from suspensions of MTB, MMDR, MBV and MAV proceed according to General Instructions for preparation of Nosodes group N-IV of Homeopathy Pharmacopeia and is labeled as Emtact Nosode. The results exhibited that no viable cells of any Mycobacteria were present in above the 4c Potency of all the Nosode Preparations. Also no Mycobacterial DNA was detected at the 30c potency of any of the Preparations of the nosode.
- Sterility Testing of Emtact Nosode Preparation was done as per standard method of Indian Pharmacopeia. Emtact Nosode of potency 6C and 30C was found to be sterile and devoid of any bacterial or fungal contamination.
- Infectivity Testing of Emtact Nosode Preparation was performed *in-vitro* using RAW cell line. Emtact Nosode of Potency 6C and 30C was found to be devoid of M.tuberculosis and it didn't show any cytopathic effect.

7. Synthesis of Indole incorporated phenylthiazole derivatives as potential biological agents

Investigator	Mr. Sushant R Kaple
Guide	Dr. Anil S Bobade
Funding Agency	Haffkine Institute

The class of heterocyclic compounds known as thiazole is found in many natural and synthetic products with a wide range of pharmacological activities, such as antiviral, anticancer, antibacterial, antifungal, anticonvulsant, antiparkinsonian and anti-inflammatory activities that can be well illustrated by the large number of drugs in the market containing this function group. Indole is an important heterocyclic system because it is built into proteins in the form of amino acid tryptophan, because it is the basis of drugs like indomethacin and because it provides the skeleton of indole alkaloids -biologically active compounds from plants including strychnine and LSD. The incorporation of indole nucleus, a biologically accepted pharmacophores in medicinal compounds has made versatile number of heterocyclic compounds possessing wide spectrum of biological activities such as Anti-inflammatory and analgesic, Antiarthritis, Antimigraine, Nootropic, CNS stimulant, Antihypertensive, Antibiotic.

In the present study, Indole nucleus is treated with various phenacyl bromides to incorporate various substituted thiazole rings to form phenylthiazole derivatives. Till now the compounds of intermediate steps & few derivatives are obtained along with their uncorrected melting points. Further the compounds will be confirmed by various spectroscopic analyses such as U.V. Visible spectroscopy, I.R. spectroscopy, N.M.R spectroscopy etc. and also they will be screened for their biological properties.

8. Validation of Reproductive Toxicity Parameters in *Wister rats*

Investigator	Dr. Mrunal Ghag Sawant
Guide	Dr. Abhay Chowdhary
Funding agency	Haffkine Institute

The objective of this study was to provide general information concerning the effects of a test substance on male and female reproductive performance, such as gonadal function, oestrous cycle, mating behavior, conception, parturition, lactation and weaning. It is not designed to determine specific cause and effects in all cases and will require modifications to study substances administered by the inhalation route. The study also provides preliminary information about developmental toxic effects of the test substance, such as neonatal morbidity, mortality, behaviour and teratogenesis and to serve as a guide for subsequent tests.

The test substance used in this study was ethanol, a well- known developmental toxicant with immunomodulatory properties. The OECD guideline was used to study the effects of ethanol in graduated doses to several groups of male and female wistar rats in reproduction.

9. Analyses of proteins present in renal calculi

Investigators	Dr. Usha Padmanabhan and Mr. Pravin Shirsat
Funding Agency	Haffkine Institute

Renal calculi (or kidney stones) have affected mankind since history began and the disease appears in many parts of the world with variable intensity. Calculi can be segregated into three categories: simple calculi, which contain a single urinary constituent; mixed calculi, which contain two or more constituents and foreign body calculi, which may be present due to introduction of some constituents from outside the body and their size can vary considerably from little more than a pinch to the size of an egg. Proteins such as calgranulin (an S-100 calcium binding protein), Tamm-Horsfall protein, glycosaminoglycans, uropontin, nephrocalcin, prothrombin, F1 peptide, and bikunin present in urine also act as inhibitors to stone formation. However, when these substances fall below their normal proportions, the urine becomes supersaturated with one or more solutes which can precipitate out, a seed crystal may be formed by the process of nucleation. Our previous study has indicated that genetic factors may have a say in renal calculi formation. Hence we wish to analyse proteins present in renal calculi and look for any correlations that may be present. To this end we have standardized procedures to solubilize kidney stones, so that samples can be analysed through protein gel electrophoresis.

10. Title of Project: In silico drug design for members of the Inositol phosphate kinase (IPK) family

Investigator	Dr. Usha Padmanabhan, Mr. Anand Chintakrundi & Dr. Meena Kanyalkar
Funding Agency	Haffkine Institute & Kundnani College of Pharmacy

The mammalian inositol phosphate kinase (IPK, PFAM accession no. PF03770) family consists of the inositol trisphosphate 3-kinases (IP3-3Ks), the inositol phosphate multikinases (IPMKs) and the inositol hexakisphosphate kinases (IP6-Ks) (refs..). The IP3-3Ks serve three functions (1) to metabolize IP3, thus remove the stimulus triggering intracellular Ca²⁺ mobilization (2) to produce IP4, which has its own functions (3) to provide the precursor for the production of all higher inositol phosphates in cells. The inositol phosphate multi-kinase (IPMK) as the name suggests, phosphorylates multiple inositol phosphate substrates to produce Ip4 and Ip5 from IP3 and IP4 respectively. Loss of the second member of the IPK family, IPMK is lethal to mice (embryos do not survive past E8.5), which has been ascribed to the fact that these knockouts do not have the essential molecule InsP₆ (refs), in addition to having several developmental defects. The IP6K phosphorylate IP6 to generate a pyro-phosphorylate inositol phosphate namely 5-PP-InsP₅ or 5-InsP₇.

We have previously established that (N2-(*m*-(Trifluoromethyl)benzyl)N6-(*p*-nitrobenzyl) purine), TNP was a specific inhibitor for IP6-Ks (ref). In addition, based on their reported inhibition of the Ip3-3K, we speculated that two structural analogs of TNP namely, N2-(*m*-(Trifluoromethyl)benzyl)N6-(*p*-aminobenzyl)purine), TAP and N2-(*m*-(Trifluoromethyl)benzyl)N6-benzyl purine), TBP would also be specific inhibitors for the Ip6-K (Padmanabhan et al, J. Biol. Chem. 2009). Since, TNP is a purine homolog (figure 1) and probably binds to the ATP binding cassette in the protein. Through this project we wish to synthesize specific inhibitors to all three IPK family members. We have successfully analysed TNP binding to Ip6-K2 and are in the process of modifying the drug to suit other IPK family members.

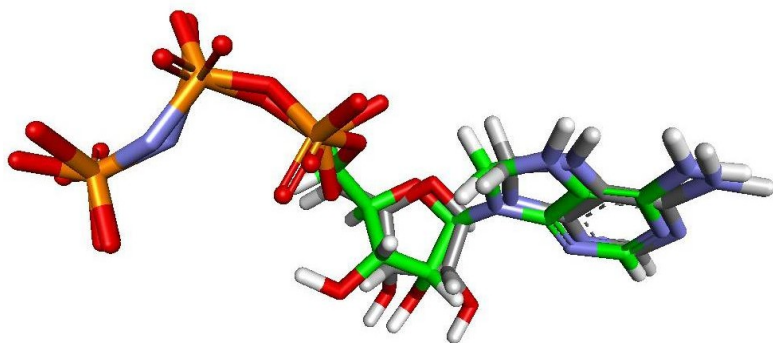


Figure 1: Superimposition of AMP-NP in the conformation present in the X-ray crystal structure (green) and docked molecule (grey).

11. Evaluation of Anti plasmodial potential of plant derived alkaloids

Investigator	Dr.Saroj Bapna
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Guide	Dr. Abhay Chowdhary
Co-Guide/mentor	Dr.Mira Ramaiya
Funding Agency	ICMR

The overall aims and objectives of the present project is to locate, isolate, identify and evaluate antimalarial potential of novel bioactive alkaloids from plants traditionally used for medicinal purpose in India. since alkaloids have diverse structures and many had shown a range of pharmacological activities including antimalarial activity. Total twenty plants of 12 different families were selected for preliminary. antiplasmodial screening, based on their traditional claims. Out of these twenty plants twelve plants were screened in the first year of study. Eight new plants were added this year and extracts of these plants were subjected to antiplasmodial activity testing using % inhibition of parasitaemia. Preliminary phytochemical analysis was done to observe the presence of alkaloid in the extract. *In vitro* antiplasmodial activity of crude alkaloidal extract was determined against *Plasmodium falciparum* 3D7 strain. The IC₅₀ of crude alkaloidal extract was ranging from 8.25 to 69.47 µg/ml. Cytotoxicity was observed by both MDCK cell using the MTT tetrazolium-based colorimetric technique and Brine shrimp lethality bioassay.

Among the plants tested positive for alkaloid content and with promising in-vitro antiplasmodial activity two promising plants Argemone Mexicana (IC₅₀ 08.25µg/mL) and Datura innoxia (IC₅₀ 15.58 µg/mL) have been selected for further investigation. Initial work on HPTLC analysis of berberine alkaloid in Argemone Mexicana has been in progress to test in vivo in murine malaria model.

By targeting alkaloid-containing medicinal plants, it is hoped that structural novelty with the required bioactivity will be achieved more efficiently to develop a plant based drug. It is expected that the project will add value to our indigenous plants and indigenous knowledge.

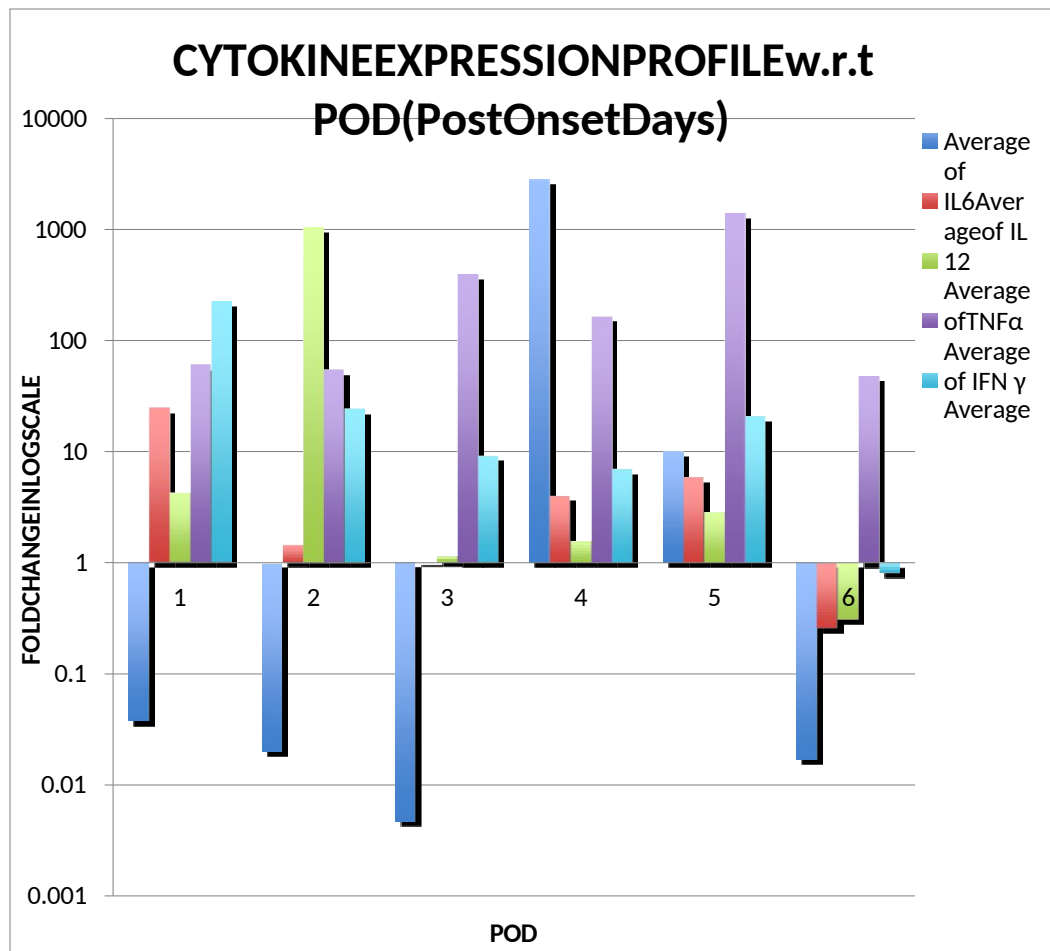
12. To Study Immunopathology and Genetic Diversity of Human Malaria in and around Mumbai Region

Investigator	Mr. Rahul Ashok Gosavi
Guide	Dr. Ranjana A Deshmukh
Co-Guide/mentor	Dr. Abhay Chowdhary
Funding Agency	Haffkine Institute

Malaria is a major public health problem in India, accounting for sizeable morbidity, mortality and economic loss. From the past three years the cases of malaria had considerably increased the morbidity rate because of the parasites becoming resistance to the drug. *Plasmodium vivax* infection has been considered for a long time a benign and self-limited disease, mainly when compared to the burden of *Plasmodium falciparum* infection in Asian countries. Some of the complications seen in *P. vivax* malaria may be related to cytokine-mediated injury. *P. vivax* has been reported to induce a greater inflammatory response than *P. falciparum* (with equal or greater parasite load), resulting in higher levels of cytokine release. The pyrogenic threshold is also lower in *P. vivax* infections, resulting in fever at lower levels of parasitemia. The present study was designed to examine the expression of these cytokines such as TNF- α , Interleukin 6 (IL 6), Interferon-gamma (IFN- γ), Interleukin 12 (IL 12) and Interleukin 10 (IL 10) from the blood of *Plasmodium vivax* malaria infected patients.

Major breakthrough of the project

The present study was designed to examine the expression of these cytokines such as TNF- α , Interleukin 6 (IL 6), Interferon-gamma (IFN- γ), Interleukin 12 (IL 12) and Interleukin 10 (IL 10) from the blood of *Plasmodium vivax* malaria infected patients. In cytokine expression study, TNF- α , which is related to *P. vivax* paroxysms, was according to infection severity. We observed that there was a down regulation of IL-6 suggesting not too much important role in the severity of *Plasmodium vivax* malaria. In our study, there was increased up-regulation of IL-10 and IFN- γ in *P. vivax* malaria suggests a reciprocal regulation. The upregulation of IL-10 was higher in the group with high parasite density. This indicates that IL - 10 has an important regulatory role in malaria infection, controlling the intensity of the immune response.



More investigation with large number of sample size, expression of cytokines and chemokines both at mRNA and protein levels, association with clinical symptoms should be carried out in similar study groups likewise here.

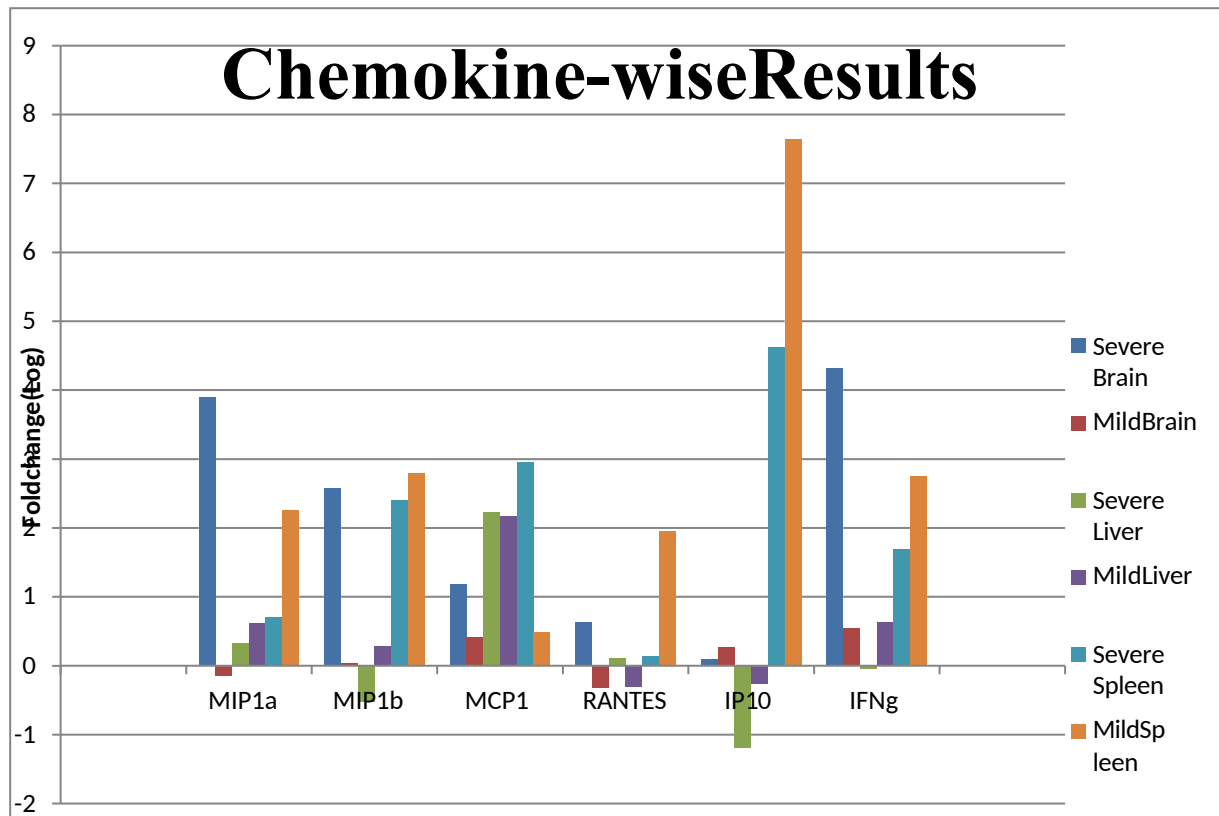
13. Assessment of Inflammatory Chemokine Responses involved in the Experimental Murine Malaria

Investigator	Mr. Rahul Ashok Gosavi
Guide	Dr. Ranjana A Deshmukh
Co-Guide/mentor	Dr. Abhay Chowdhary
Funding Agency	Haffkine Institute

Malaria remains one of the most common infectious diseases in the world with an estimated 500 million clinical cases per year. One of the most lethal complications of infection with *Plasmodium falciparum* is Cerebral malaria (CM). Mouse models of CM have been widely used to gain insight into the pathogenesis of CM. Although no animal model fully recapitulates the human disease, infection of certain mouse strains with *Plasmodium berghei* ANKA induces murine CM with many characteristics of the human disease. Chemokines are a super family of chemotactic cytokines that play important roles in the generation and delivery of immune and inflammatory responses. The present study was designed to examine the expression of these chemokines such as IP-10 (a CXC Chemokine), RANTES, macrophage-derived Chemokine (MDC) and Monocyte Chemotactic Protein-1 (MCP-1) (CC chemokines) in the spleen, liver and brain from mice infected with *P. berghei* ANKA. The expression of IFN gamma and MIP 1 alfa /beta in the same organs was also examined to estimate the systemic production of inflammatory cytokines & Chemokines, and to study their relationship to CM Severe case & Mild case in our model.

Major breakthrough of the project

The present study made an attempt to describe the role of important chemokines involved in the spleen, liver and brain pathogenesis from mice infected with *P. berghei* ANKA. The results of this study may conclude that the increase in production of RANTES follows the course of *P. berghei* malaria infection, thus RANTES and its receptors MIP-1 α , MIP 1- β were detected at their highest levels at day six and day eight post-infection. Though this basic work supports the role of chemokines in severity of experimental murine malaria in its least form, there may be more to discover before implicating these findings



One clear difference between Severe and Mild malaria is that in both Brain and liver there was high up-regulation of RANTES and MCP-1 mRNA expression after infection in mice, while the liver of mild malaria mice showed down regulation of these RANTES and IP 10 chemokines, which might lead to death through a yet unknown process. So Further studies will be needed to clarify the role of chemokines in determining the process of Th1 and Th2 differentiation in the brain, and also in affecting the pathogenesis of *P. berghei*-induced Severe and Mild malaria.

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6. Ritwik Dahake, Shraddha Mehta, Sneha Yadav, Abhay Chowdhary, Ranjana A Deshmukh. Polymorphisms in reverse transcriptase and protease genes of HIV-1 Subtype C from Mumbai. Oral presentation (e-poster) at the 2nd International Science Symposium on HIV & Infectious Diseases, 30 January–1 February 2014, YRG Care, Chennai, India
7. Jaya Mukherjee, Ritwik Dahake, Deepa Das, Abhay Chowdhary. Prevalence of Human Papillomavirus (HPV) in the oral cavity of HIV-seropositive Indian women undergoing HAART. Oral presentation (e-poster) at the 2nd International Science Symposium on HIV & Infectious Diseases, 30 January–1 February 2014, YRG Care, Chennai, India
8. Mansi Malik, Sandeepan Mukherjee, Shefali Banerjee, Mira Ramaiya, Abhay Chowdhary. Assessment of Redox Markers in Anti-Malarial Drug Therapy of Experimental Murine Malaria. Oral presentation at SFRR, India. 27-30 January 2014, Lonavala, India.
9. Sandeepan Mukherjee, Rahul Gosavi, Mansi Malik, Shefali Mishra, Mira Ramiya, Abhay Chowdhary. Assessment of Inflammation Regulators in Murine Model of Cerebral Malaria.

International Scientific meeting on Recent developments in Malaria Parasite Biology at ICGB, New Delhi, from 2nd – 4th December 2013.

10. Mansi Malik, Shefali Banerjee, Sandeepan Mukherjee, Mira Ramaiya, Abhay Chowdhary. Expression of Heme Oxygenase 1 in Primaquine Treated Murine Model of Malaria. International Scientific meeting on Recent developments in Malaria Parasite Biology at ICGB, New Delhi, from 2nd – 4th December 2013.
11. Mansi Malik, Sandeepan Mukherjee, Pooja Das, Mira Ramaiya, Abhay Chowdhary. Assessment of Metal Responses in Murine Model of Malaria. International Scientific meeting on Recent developments in Malaria Parasite Biology at ICGB, New Delhi, from 2nd – 4th December 2013.
12. Rahul Gosavi, Neha Khopade, Paras Mahale, Sandeepan Mukherjee, Mira Ramaiya, Abhay Chowdhary. To Study Immunopathology and Genetic Diversity of Human Malaria in and around Mumbai Region. International Scientific meeting on Recent developments in Malaria Parasite Biology at ICGB, New Delhi, from 2nd – 4th December 2013.
13. Rahul Gosavi, Tushar Bhabal, Sandeepan Mukherjee, Mira Ramaiya, Abhay Chowdhary. Assessment of Inflammatory Chemokine Responses involved in the Experimental Murine Malaria. International Scientific meeting on Recent developments in Malaria Parasite Biology at ICGB, New Delhi, from 2nd – 4th December 2013.
14. Shraddha Mehta, Sandeepan Mukherjee, Gayatri Nair, Nakul Shah, Abhay Chowdhary. Assessment of gene expression of HMOX-1 and iNOS in CNS of Murine Model of Rabies. Presented at Legacy of Nitric Oxide Discovery: Impact on Disease Biology, November 5-6 2013, RGCB, Thiruvananthapuram, India.
15. Aashutosh Mule, Ritesh Vairagade, Samridhi Pathak, Abhay Chowdhary, Sandeepan Mukherjee. Immunomodulatory and Nitric Oxide Inhibitory activity of Indian Medicinal Plants. Presented at Legacy of Nitric Oxide Discovery: Impact on Disease Biology, November 5-6 2013, RGCB, Thiruvananthapuram, India.
16. Karthik Kalyan, Binal Jakhia, Suvigya Jain, Dr.Mukund Joshi, Dr.Abhay Chowdhary. Application of Artificial Neural Networks towards the Determination of Presence of Disease Conditions in Liver and Ultrasound Kidney Images. 2nd IIT Madras – Tokyo Tech Joint Symposium on Techniques and Applications of Bioinformatics. 27th – 28th September, IIT-Madras, Chennai, India.
17. Vrushali N Patil, Ashish L Asrondkar, Neha U Mishra, A S Bobade, Abhay Chowdhary, Microwave assisted synthesis of Triazole derivatives; presented at Indian Science Congress, Jammu, February 2014.

18. Neha U Mishra, Vrushali N Patil, Ashish L Asrondkar, Anil S Bobade and Abhay Chowdhary, Synthesis of Some Substituted 4-Thiazolidinones derivatives as possible anti-microbial agent; presented at Indian Science Congress, Jammu, February 2014.

TESTING

DEPARTMENT OF VIROLOGY

1. List Of Testing Services Provided By The Department

Sr. No.	Name of the test
1.	Detection of Influenza Virus
2.	Antiviral activity of biological / disinfectants / actives (Qualitative)
3.	Antiviral activity of biological / disinfectants / actives (Quantitative)
4.	Detection of virus by cell culture (HSV, CMV, JEV)
5.	Detection of Rabies (Fluorescent Ab Test)
6.	Detection of Rabies/JEV (Conventional Nested RT-PCR)

2. The number of tests performed by the Department in year 2013-2014:

Sr. No.	Nature of the sample tested And the Test performed	Total number of sample tested
1	Detection of Influenza Virus	160
2	Detection of Rabies (Fluorescent Ab Test)	6
3	Detection of Rabies/JEV (Conventional Nested RT-PCR)	12

3. Specialized testing/research provided by the Department

1. Evaluation of various disinfectant products for virucidal efficacy
2. Evaluation of anti-HIV efficacy of drug formulations
3. In-vitro evaluation of hepatotoxicity/hepatoprotectivity of herbal formulations using primary cells model.

DEPARTMENT OF CLINICAL PATHOLOGY

The department receives clinical specimens from various hospitals and general nursing homes for routine investigations. The services offered cover the following areas:

- Diagnostic bacteriology
- Serology
- Testing of commercial synthetic compounds for antibacterial, antifungal and antituberculosis activity.
- Diagnostic Mycology.
- Operation theatre monitoring
- Routine haematological examination.
- Urine and stool testing (Routine and microscopy).
- Detection of malarial parasites.
- Histopathological examination of surgical specimens and biopsies.

2. The number of tests performed by the Department in year 2013-2014:

Sr. No.	Nature of the sample tested And the Test performed	Total number of sample tested
1	Haematology & Other test (HB, CBC, ESR, MP, Urine R/M)	626
2	Serology (Widal, Weil-Felix, Brucella)	465
	Microbiology (OT Swab, Aerobic Culture, AST)	1044
	Mycology (Fungal Culture, Fungal Identification & Sensitivity)	51
	Anti-tuberculosis activity of synthetic compounds	
	Total	2285

TESTING UNIT

1. The list of testing services provided by the Department:

- a) Testing of Liquors (Such as Country liquor from manufacturer and retailers, Wine, vodka, rum, Brandy, whisky, toddy...etc) samples from excise department, Government of Maharashtra.
- b) Testing of Denaturants.
- c) Testing of water samples.
- d) Testing of fine chemicals.

2. The number of tests performed by the Department in year 2013-2014:

Sr. No.	Nature of the sample tested And the Test performed	Total number of sample tested
1	TDL, ODS, SDS	5,127
2	CL – I	10,920
3	CL – III	7,741
4	Toddy	3,424
5	TL (Beer, IMFL)	1,341
6	TCL	40
7	TFS	01
8	TAC	12
9	CL-II	03
10	Miscellaneous Samples	04
11	Revenue Achieved By giving Duplicate report to the party	136 (Reports)
	Total Revenue in Rs	1,01,81,352

CHEMOTHERAPY DEPARTMENT

1. The Chemotherapy department is involved in testing activities of **HPLC** (High Performance liquid chromatography), **GCMS** (Gas chromatography mass spectrophotometer), and **IR** (Infrared spectrophotometer) samples on commercial & academic purposes.

2. Following tests performed by Chemotherapy Department in year 2013-14.

Sr. No	Nature of sample tested & the test performed	Total number of sample tested
1	Organic compounds are tested by FTIR	18
2.	Snake venom was tested by using HPLC	04
3.	Disinfectant was tested by GCMS	01
4.	Poly aluminum Chloride was tested by chemical test	01

BIOCHEMISTRY DEPARTMENT

1. The list of testing services provided by the Department:

SR. NO.	NAME OF TEST
1	Blood Glucose (F)
2	Blood Glucose (PP)
3	Total Cholesterol
4	Triglycerides
5	HDL Cholesterol
6	SGOT
7	SGPT
8	Total Bilirubin
9	Direct Bilirubin
10	Blood Urea Nitrogen
11	Creatinine
12	Stone analysis (Kidney, Gall, Liver)

2. The number of tests performed by the Department in year 2013-2014:

Sr. No.	Nature of the sample tested And the Test performed	Total number of sample tested
1	Serum / plasma	357 (paying) + 204 (non-paying) = 561
2	Stone (Kidney, Gall, Liver)	Kidney- 43 Gall- 02 Liver- 02

BACTERIOLOGY DEPARTMENT

Sr. No.	Nature of the sample tested And the Test performed	Total number of sample tested
1	Water sample	65
2	Water purifier	07
3	Disinfectant solution	13
4	Miscellaneous	171

SNAKE FARM

TESTING ACTIVITIES:

1. The list of testing services provided by the Department:

- 1 Evaluation of Anti Termite activity of test compound
- 2 Evaluation of Anti Rodent activity of test compound
- 3 Identification of Unknown Venom Sample

2. The number of tests performed by the Department in year 2013-2014:

The details of the tests undertaken during Year April 2013 to March 2014 are as follows:

Sr. No.	Nature of the sample tested And the Test performed	Total number of sample tested
1	Evaluation of Anti Termite activity of test compound	2
2	Evaluation of Anti rodent activity of test compound	5
3	Identification of Unknown Venom Sample	5
Total		12

3. Other department activities

- 3.1.** Department supply Lyophilized venom to various institutes' colleges for research purpose. Statement of venom production and supply during Year April 2013 to March 2014 are as follows

Snake and scorpion	Opening stock (gm)	Production (gm)	Supply (gm)		Lyophilized used for research	Closing stock (gm)	Total value (Rs)
			External	Gift			
Cobra	134.33	-	3.734	-	-	130.59	13,05,900.00
R. Viper	20.89	-	0.834	-	-	20.05	2,00,500.00
Krait	0.790	-	0.198	-	-	0.592	8,288.00
Echis	16.95	-	0.384	-	0.230	16.33	2,28,620.00
Red scorpion	12.37	-	0.884	-	-	11.486	1,60,804.00
Total sale							19,04,112.00

- 3.2** Department conduct "Survey of venomous and non venomous snakes", provides expert advice, measures and tools required for controlling the snake menace. Total number of snake survey conducted during the period 1st April 2013 to 31st 2014 are as follows

Sr. No.	Period of work	Total number of survey
1	April 2013-March 2014	39

- 3.3** Department provides certificates for Identification of different types of Venomous and Non venomous snakes. Total number of identification report issued during the period 1st April 2011 to 31st 2012 are as follows:

Sr. No.	Period of work	Total number of snakes received for identification	Total number of reports issued
1	April 2013-March 2014	38	38

TOXICOLOGY DEPARTMENT

TESTING ACTIVITIES:

1. The list of testing services provided by the Department:

- 1.1 Acute oral toxicity in mice/rats
- 1.2 Primary skin irritation in Rabbits.
- 1.3 Mucus membrane irritation in Rabbits.
- 1.4 Intracutaneous sensitization in guinea pigs.
- 1.5 Oral LD50 in Rat
- 1.6 Dermal LD50 in Rabbits.
- 1.7 Acute fish toxicity as per OECD guideline.

2. The number of tests performed by the Department in year 2013-2014:

Sr. No.	Nature of the sample tested And the Test performed	Total number of sample tested
1	Acute oral toxicity in mice	2
2	Acute fish toxicity test as per OECD Guideline	1
3	Acute oral toxicity in rat as per OECD guideline	1
4	Acute Dermal Irritation as per OECD guideline	1
Total		5

LIBRARY

AIMS AND OBJECTIVES:

The aim and objective of the Haffkine Institute Library is to collect, organize, search and retrieve information in the areas of prime activities of the institute i.e. Biomedical and allied sciences with a special reference to the communicable diseases. The library subscribes to specialized national and international journals from various renowned publishers and scientific societies.

This year library continued to provide online scientific search and retrieval facilities to the staff, researchers and students. During the period total 2,648 users made use of the online search and retrieval facility offered by the library. Users mainly consisted of Scientific Staff, Research Fellows and the students enrolled for the various programmes of the institute. The library also provided reference service by Telephone, Email, Post, Courier, etc. to the distant users who could not come to the library.

The library made available different research and scientific publications from other libraries to the scientists and students of the Haffkine Institute for 7 times on the basis of Inter Library Cooperation. Similarly, 1 publication available in our library was made available to other libraries in the current year.

The library regularly imparted induction and orientation training to outside visitors and new students of the institute on the library usage and how to conduct the literature search effectively.

HAFFKINE INSTITUTE FOR TRAINING, RESEARCH AND TESTING LIBRARY: 2012-13

YEAR	2013-2014
Total Titles	10563
Total Bound Volumes of Journals	27161
Outside Visitors visiting the library	863
Staff & Students of the Institute visiting the library	4410

