

Shabir Ahmad Mir, MSc, PhD

Assistant Professor,
Department of Medical Laboratory Sciences
College of Applied Medical Sciences
Majmaah University, Saudi Arabia.



PERSONAL DETAILS

D.O.B: 25 March 1983

Nationality: Indian

Village: Singo Narbal,

District: Pulwama,

State: Jammu & Kashmir,

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ACADEMIC PROFILE

Doctor of Philosophy (PhD): Department of Biochemistry, Post Graduate Institute of Medical Education and Research, Chandigarh, India (30 July, 2007- 16 July, 2013)

Title of PhD Thesis: Immunobiological role of non-classically secreted N-formylated protein/peptides of *Mycobacterium tuberculosis* H₃₇Rv in experimental tuberculosis

MSc in Biochemistry- Department of Biochemistry, University of Kashmir, India (2004- 2006).

BSc in Biochemistry- SP college, University of Kashmir, India (2001-2003).

RESEARCH INTERESTS AND SPECIALIZATION

1. Biochemistry and Molecular biology
2. Proteomics and Structural Biology
3. Infectious diseases and Immunology

PEER REVIEWED RESEARCH PUBLICATIONS

1. Mir SA and Sadhna Sharma (2022). Immunotherapeutic Potential of N-Terminally Formylated ESAT-6 Protein in Murine Tuberculosis. *International Journal of Mycobacteriology*, 11, 108-12. (<https://www.ijmyco.org/text.asp?2022/11/1/108/339519>). ESCI, Q4 (IF=1.21)
2. Vatsa P, Jahan S, Ansari UA, Khan A, **Mir SA**, Alshehri BM, et al., (2022). Stem Cell Safety and Sterility Testing: A Promising Approach in Regenerative Medicine. A book chapter in the book *Stem Cell Production; Processes, Practices and Regulations* (ISBN: 978-981-16-7588-1). Publisher; Springer Nature. (In press). [Book chapter](#)
3. Jahan S, Mukherjee S, Ali S, Bhardwaj U, Choudhary RK, Balakrishnan S, Naseem A, **Mir SA**, Banwas S, Alidrous M, Alyenbaawi HE, Iqbal D, Siddiqui AJ (2022). Pioneer role of Extracellular Vesicles as Modulators of Cancer initiation in Progression, drug therapy and vaccine prospect. *Cells*, 11(3), 490. (Doi: <https://doi.org/10.3390/cells11030490>). SCIE, Q1 (IF= 6.6)
4. **Mir SA**, Alaidarous M, Mir BA, Alshehri B, Dukhyil AAB, Banawas S, et al., (2022). Identification of Mycobacterial RNA Polymerase inhibitors from the main phytochemicals

- of *Nigella sativa*: An in silico study. *International Journal of Pharmacology*. (In press) SCIE, Q4 (IF=0.751).
5. Siddiqui S, Ahmad R, Alaidarous M, Zia Q, **Mir SA**, Alshehri B, et al., (2022). Phytoconstituents from *Moringa oleifera* fruits target ACE2 and open spike glycoprotein to combat SARS-CoV-2: An integrative phytochemical and computational approach. *Journal of Food Biochemistry*. (DOI: [10.1111/jfbc.14062](https://doi.org/10.1111/jfbc.14062)). SCIE, Q3 (IF=2.72)
 6. **Mir SA** (2021). Investigation of the anti-TB potential of selected phytochemicals of *Nigella sativa* using molecular docking approach. *Journal of Pharmaceutical Research International*, 33, 278-286. (DOI: [10.9734/jpri/2021/v33i45B32805](https://doi.org/10.9734/jpri/2021/v33i45B32805)). ESCI, Q4 (IF=NA)
 7. Alsagaby SA, Aljouie A, Alshammari TH, **Mir SA**, Alhumaydhi FA, Abdulmonem WA et al., (2021). Haematological and radiological-based prognostic markers of COVID-19. *Journal of Infection and Public Health*, 14, 1650-1657. (DOI: <https://doi.org/10.1016/j.jiph.2021.09.021>). SCIE, Q2 (IF= 3.718)
 8. Kinyoki ID, Osgood-Zimmerman AE, Bhattacharjee NV, Local Burden of Disease Anaemia Collaborators (**Mir SA** and others), Kassebaum NJ and Hay SI (2021). Anemia prevalence in women of reproductive age in low- and middle-income countries between 2000 and 2018. *Nature Medicine*, 27(10):1761–1782. (DOI: <https://doi.org/10.1038/s41591-021-01498-0>). SCIE Q1 (IF= 53.44)
 9. Sidiq M, Alenazi W, Kashoo FZ, Qasim M, Lopez MP, Ahmad M, Mani S, Shaphe MA, Khodairi O, Almutairi A, **Mir SA** (2021). Prevalence of non-specific chronic low-back pain and risk factors among male soldiers in Saudi Arabia. *Peer*, 9:e12249. (DOI: [10.7717/peerj.12249](https://doi.org/10.7717/peerj.12249)). SCIE, Q2 (IF= 2.984)
 10. **Mir SA** (2021). Structure and function of the important internalins of *Listeria monocytogenes*. *Current protein and peptide Sciences*, 22(8), 620-628. DOI: [10.2174/1389203722666210902163300](https://doi.org/10.2174/1389203722666210902163300). SCIE, Q3 (IF=3.272)
 11. **Mir SA**, Firoz A, Alaidarous M, Alshehri B, Dukhyil AA, Banawas S, Alsagaby SA, et al., (2022). Identification of SARS-CoV-2 RNA-dependent RNA polymerase inhibitors from the major phytochemicals of *Nigella sativa*: An in silico approach. *Saudi Journal of Biological Sciences*, 29(1):394-401. (DOI: [10.1016/j.sjbs.2021.09.002](https://doi.org/10.1016/j.sjbs.2021.09.002)). SCIE, Q2 (IF= 4.219)
 12. Iqbal D, Burhan IW, Choudhary RK, Alaidarous M, Alshehri BM, Banawas S, **Mir SA** (2021). Analysis between Cigarette and Shisha Smokers for Early Atherogenesis: A Cardiovascular Disease. *Journal of Pharmaceutical Research International* 33(41A): 175-186. (DOI: [10.9734/jpri/2021/v33i41a32316](https://doi.org/10.9734/jpri/2021/v33i41a32316)). ESCI, Q4 (IF= NA)
 13. Alqahtani SM, Alsagaby SA, **Mir SA**, Alaidarous M, Alshehri B, Dukhyil AA, et al., (2021). Seroprevalence of Viral Hepatitis B and C among Blood Donors in the Northern Region of Riyadh Province, Saudi Arabia. *Healthcare* 9(8), 934. (DOI: <https://doi.org/10.3390/healthcare9080934>). SCIE, Q2 (IF= 2.645).

14. **Mir SA**, Alshehri BA. (2021). Seroprevalence of hepatitis B and C viral infections in the premarital adult population of Al Majmaah, Saudi Arabia. *Malawi Medical Journal*, 33(3), 221-225. (DOI: 10.4314/mmj.v33i3.10) SCIE, Q4 (IF= 0.875).
15. Alaidarous M, Choudhary RK, Alharbi R, Banawas S, Alshehri B, Dukhyil AB, **Mir S**, Alsaweed M, Waly M (2021). Serum Lipid Profile in Patients Visiting King Khalid General Hospital in Majmaah, Saudi Arabia. *Bioscience Biotechnology Research Communications* 14:2, 563-569. (DOI: <http://dx.doi.org/10.21786/bbrc/14.2.19>). ESCI (IF= NA)
16. **Mir SA**, Alshehri BM, Alaidarous A, et al., (2020) Prevalence of Hemoglobinopathies (β -thalassemia and sickle cell trait) in the Adult Population of Al Majma'ah, Saudi Arabia. *Hemoglobin* 44:1, 47-50. (DOI: 10.1080/03630269.2020.1729175). SCIE, Q4 (IF=0.849).
17. **Mir SA**, Sharma S. (2020). Adjunctive Immunotherapeutic Efficacy of N-formylated Internal Peptide of Mycobacterial Glutamine Synthetase in Mouse Model of Tuberculosis. *Protein and Peptide Letters* 27(3): 236 – 242. (DOI: 10.2174/0929866526666191028151615). SCIE, Q4 (IF= 1.89).
18. **Mir SA**, Sharma S. (2019). Immunotherapeutic potential of an N-formylated peptide of *Listeria monocytogenes* in experimental tuberculosis. *Immunopharmacology and Immunotoxicology* 41:2, 292-298. (DOI: 10.1080/08923973.2019.1593446). SCIE, Q3 (IF= 2.73).
19. Bashir H, Wani BA, Ganai BA, **Mir SA** (2019). Protein Glycosylation: An Important Tool for Diagnosis or Early Detection of Diseases. A book chapter in the book *Protein Modificomics, from modifications to clinical perspectives*, Edited by Tanveer Ali Dar and Laishram Rajendrakumar Singh (ISBN-13: 978-0128119136). Publisher; Academic Press (An imprint of Elsevier). [Book chapter](#)
20. Alaidarous M, Choudhary RK, Waly MI, **Mir S**, Dukhyil AB, Saeed SS, Alshehri BM (2018). The prevalence of transfusion-transmitted infections and nucleic acid testing among blood donors in Majmaah, Saudi Arabia. *Journal of Infection and Public Health* 11:5, 702-706. (DOI: 10.1016/j.jiph.2018.04.008) SCIE, Q2 (IF= 3.718).
21. Mir BA, **Mir SA**, Khazir J, Tonfack LB, Cowan DA, Vyas D, Koul S (2015). Cold stress affects antioxidative response and accumulation of medicinally important withanolides in *Withaniasomnifera* (L.) Dunal. *Industrial Crops and Products* 74, 1008-1016. (DOI: <https://doi.org/10.1016/j.indcrop.2015.06.012>). SCIE Q1 (IF= 5.645)
22. Wani SM, **Mir SA**, Sharma S (2015). Dual Role of Inflammation in Prognosis and Prevention of Tuberculosis. *Journal of Clinical and Cellular Immunology* 6: 298. (DOI: 10.4172/2155-9899.1000298). Non-ISI (IF=3.146)
23. **Mir SA**, Verma I, Sharma S (2014). Immunotherapeutic potential of recombinant ESAT-6 protein in mouse model of experimental tuberculosis. *Immunology letters* 158, 88– 94. (DOI: 10.1016/j.imlet.2013.12.007). SCIE Q3 (IF= 3.685)

24. **Mir SA**, Sharma S (2014). Immunotherapeutic potential of N-formylated peptides of ESAT-6 and glutamine synthetase in experimental tuberculosis. *International Immunopharmacology* 18, 298-303. (DOI: [10.1016/j.intimp.2013.09.010](https://doi.org/10.1016/j.intimp.2013.09.010)). SCIE Q2 (IF= 4.932).
25. Mir BA, **Mir SA**, Koul S (2014). In vitro propagation and withaferinA production in *Withania ashwagandha*, a rare medicinal plant of India. *Physiology and Molecular Biology of Plants* 20, 357-64. (DOI: [10.1007/s12298-014-0243-5](https://doi.org/10.1007/s12298-014-0243-5)) SCIE Q2 (IF= 2.391)
26. **Mir SA**, Sharma S (2013). Role of MHC class Ib molecule, H2-M3 in host immunity against tuberculosis. *Vaccine* 31, 3818– 3825. (DOI: <https://doi.org/10.1016/j.vaccine.2013.04.005>). SCIE Q3 (IF=3.641)
27. **Mir SA**, Sharma S (2013). Cloning, expression and N-terminal formylation of ESAT-6 of *Mycobacterium tuberculosis* H37Rv. *Protein Expression and Purification* 92, 223–229. (DOI: [10.1016/j.pep.2013.09.005](https://doi.org/10.1016/j.pep.2013.09.005)) SCIE Q4 (IF= 1.65).
28. Khazir J, Mir BA, **Mir SA**, Cowan D (2013). Natural products as lead compounds in drug discovery. *Journal of Asian Natural Products Research* 15, 764–788. (<https://doi.org/10.1080/10286020.2013.798314>) SCIE Q3 (IF= 1.571)

RESEARCH/TEACHING EXPERIENCE

- **From April 2016 to Present:** Assistant Professor, Department of Medical Laboratory Sciences, Majmaah University, Saudi Arabia.
- **September 2015 to March 2016:** DS Kothari Postdoctoral Fellow, Center of Research for Development (CORD), University of Kashmir, Srinagar-190006, India.
- **March to August 2015:** Visiting Scientist at CSIR-Pretoria, South Africa.
- **February to April 2015:** Part-time Teaching Assistant in Biochemistry Department at University of Pretoria, South Africa.
- **September 2014 – August 2015:** Postdoctoral Fellow in Department of Biochemistry, University of Pretoria, South Africa.
- **23rd April to 18th September 2014:** Lecturer (contractual) in Department of Biochemistry, University of Kashmir, Srinagar, India.
- **2nd September to 31st December 2013:** Lecturer (contractual) in Department of Clinical Biochemistry, University of Kashmir, Srinagar, India.
- **2007 to 2013:** Six-years research experience during PhD. Besides PhD work, I was also involved in the following Research projects:
 - Development of Sustained release antimycobacterial drug delivery system(s) against multidrug resistant tuberculosis employing PLG nanotechnology
 - Mycobacterial peptide deformylase as a possible target for new generation antibacterial agents for experimental tuberculosis.
- **2006 to 2007:** Pre-PhD research experience as Junior Research Fellow in CSIR funded project on “Development of sustained release antimycobacterial drug delivery

system(s) against multidrug resistant tuberculosis employing PLG nanotechnology” under Professor Sadhna Sharma.

- **2005 to 2006:** One year research training during MSc Project entitled “Studies on separation and dehemation of alpha and beta subunits of adult human hemoglobin”, at Biochemistry department, University of Kashmir, India.

HONOURS AND AWARDS

- **2021-** Best Researcher award by VDGGOOD professional association, India
- **2015-** Awarded Dr DS Kothari Postdoctoral Fellowship by UGC, New Delhi
- **2014-** Awarded UP-Postdoctoral Fellowship at University of Pretoria, South Africa.
- **2012 to 2013-** Recipient of **Senior Research Fellowship** from Indian Council of Medical Research (ICMR), New Delhi.
- **2009 to 2011-**Recipient of **Junior Research Fellowship** from Indian Council of Medical Research (ICMR), New Delhi.
- **2008-**Qualified the **ICMR–JRF** examination, a prestigious national level examination in Medical sciences.
- **2007-**Qualified the national level **PhD entrance test** at Postgraduate Institute of Medical Education & Research, Chandigarh, India.
- **2006 to 2007-**Recipient of **Junior Research Fellowship** in CSIR funded project entitled “Development of Sustained release antimycobacterial drug delivery system(s) against multidrug resistant tuberculosis employing PLG nanotechnology.”
- **2005-**Qualified the prestigious **joint CSIR-UGC national eligibility test (NET)** examination in life Sciences.

PARTICIPATION IN SOCIETIES/SCIENTIFIC ORGANIZATIONS, JOURNALS AND/OR WEBSITES

- Member of the International Association of Therapeutic Drug Monitoring and Clinical Toxicology (IATDMCT).
<https://www.iatdmct.org/component/membership/?task=directory&start=160>
- Editorial Board member of EC (E-Cronicon) Pulmonology and Respiratory Medicine Journal. <https://www.ecronicon.com/ECPRM-EB.php>
- Reviewer of **BMC Immunology** Journal
(<https://bmcimmunol.biomedcentral.com/articles/10.1186/s12865-015-0081-4>)
- Bentham Ambassador of the Bentham Science Publishers.
<http://www.benthamambassadors.com/index.php>
- Editor of SM Group Open Access eBook “**Recent Trends in Immunology**”

ADMINISTRATIVE ASSIGNMENTS

- Member of Examination Unit for Bachelor Programs, College of Applied Medical Sciences, Majmaah University. **(1438 to present)**
- Member of Examination Unit for Master Programs, College of Applied Medical Sciences, Majmaah University. **(1441 to present)**
- Member of Academic Control Unit, College of Applied Medical Sciences, Majmaah University. **(1441 to present)**
- Member of Online teaching unit, College of Applied Medical Sciences, Majmaah University. **(1443 to present)**
- Member of Quality Assurance committee, Department of Medical Laboratory Sciences, Majmaah University. **(1438 to present)**
- Member of Curriculum committee for Master Program, Department of Medical Laboratory Sciences, Majmaah University. **(1440 to present)**
- Member of Curriculum committee for Bachelor Program, Department of Medical Laboratory Sciences, Majmaah University. **(1439 to present)**
- Member of Academic committee, Department of Medical Laboratory Sciences, Majmaah University. **(1438 to 1441)**
- Member of Student Affairs committee, Department of Medical Laboratory Sciences, Majmaah University. **(1438 to 1439)**
- Head of Assesment committee, Department of Medical Laboratory Sciences, Majmaah University. **(1438 to 1439)**

TEACHING ASSIGNMENTS

I am currently involved in the teaching of several courses like Biochemistry, Immunology, Immunohematology, Physiology, Body fluids, Clinical Biochemistry, Cellular and Molecular Biology to the students of Medical Laboratory Sciences Department, Majmaah University, Saudi Arabia. In addition, I am also involved in basic and applied scientific research and I am publishing the scientific data in well reputed international journals.

MASTER THESIS SUPERVISION

Thesis title	Student Name (university ID)	My Role	Submission date
Prevalence of Hepatitis B and C among Blood Donors in North of Riyadh Region, Saudi Arabia	Saeed Mohammed Ali Al-Qahtani (411103799)	Main Supervisor	8 May, 2021
Prevalence and Clinical Characteristics of Rheumatoid Arthritis in Madinah Region of Saudi Arabia	Mamdooh Adnan Abdullah Noor (411103790)	Main Supervisor	7 November, 2021

Investigating the impact of viral load of COVID19 on the severity of the infection	Talal Hamad Alshamri (411103795)	Co-supervisor	Nov, 2021
Assessment of Pro-inflammatory and Regulatory Cytokines in Saudi Patients with Rheumatoid Arthritis	Abdulaziz Bin Abdur Rahman (411103789)	Co-supervisor	In progress

CONFERENCES/SEMINARS/WORKSHOPS/SYMPOSIA outside Majmaah University

- Attended the virtual workshop entitled “**International E-workshop on Bioinformatics**” organized by Department of Biotechnology, Delhi Technological University, Delhi-110042, India (December 14-18, 2020)
- Attended the virtual conference entitled “**IATDMCT Virtual Congress**” organized by International Association of Therapeutic Drug Monitoring & Clinical Toxicology (IATDMCT). (September 14-16, 2020)
- Delivered an invited lecture in the workshop entitled “**Medical Laboratory Vision 2030**” organized by Majmaah University Stroke Research Chair (SATSC) & King Khalid General Hospital, Al Majmaah, Saudi Arabia (April 21-22, 2019)
- Participated in 11th **Jammu and Kashmir Science Congress (JKSC)-2015** held at **University of Kashmir**.
- Attended the Two day National Symposium on **Biotechnological interventions for upgradation of food products of India** (BIUFPI) - 2015 organized by Department of Food Science and Technology, University of Kashmir, India. (September 9-10, 2015)
- Poster presentation in Biochemistry Symposium-2015 at **University of Pretoria, South Africa**.
- Attended the EMBO Global Exchange Lecture Course **Frontiers in innate immunity and drug discovery** from 6–11 July 2015 in **Johannesburg, South Africa**. (July 6-11, 2015)
- Attended Mini-workshop on **Synchrotron Radiation and Synchrotron-based Spectroscopies 2015** organized by University of Johannesburg, **South Africa**.
- Attended international conference on **Cellular and Molecular mechanisms of Disease processes 2014** organized by Department of Biotechnology, University of Kashmir, India. (April 13-16, 2014)
- Poster presentation in 9th **Jammu and Kashmir Science Congress (JKSC) 2013** held at University of Kashmir.
- Golden Jubilee Celebrations CME-2012 on **Molecular Diagnosis of Genetic Diseases** organized by Department of Biochemistry, PGIMER, Chandigarh. (December 22-23, 2012).
- Symposium on **Advanced Techniques in Basic Research: Tools of 21st century** (May 2010) organized by Association of Basic Medical Scientists, PGIMER, Chandigarh, India. (May 1, 2010)

- Attended **Chandigarh Science Congress** (CHASCON-2008), organized by Punjab University, Chandigarh, India. (March 2008)

CONFERENCES/SEMINARS/WORKSHOPS/SYMPOSIA at Majmaah University

- Attended a Webinar on “**Proteomics in Biomedical Research**”, organized by the Deanship of Research (DSR) at Majmaah University, Kingdom of Saudi Arabia (March 31, 2021)
- Attended the Workshop entitled “**Multiple Choice Questions in Basic & Clinical Sciences**” at College of Applied Medical Sciences, Majmaah University, Kingdom of Saudi Arabia (17/11/2019).
- Attended the Workshop entitled “**Psychometric analysis of measurements**” at College of Applied Medical Sciences, Majmaah University, Kingdom of Saudi Arabia (10/11/2019).
- Attended the Workshop entitled “**World Quality Month Awareness Campaign**” at College of Applied Medical Sciences, Majmaah University, Kingdom of Saudi Arabia (24/10/2019).
- Attended the Workshop entitled “**NCAAA SSRP - Review of Standards**” at College of Applied Medical Sciences, Majmaah University, Kingdom of Saudi Arabia (13/10/2019).
- Attended the Workshop entitled “**Importance of Researcher’s ID**” at College of Applied Medical Sciences, Majmaah University, Kingdom of Saudi Arabia (29/09/2019).
- Attended the Workshop entitled “**Mandatory Requirements for NCAAA Program Accreditation**” at College of Applied Medical Sciences, Majmaah University, Kingdom of Saudi Arabia (15/09/2019).
- Attended the Workshop entitled “**Faculty Orientation Program**” at College of Applied Medical Sciences, Majmaah University, Kingdom of Saudi Arabia (08/09/2019).
- Attended the Workshop entitled “**Desire to Learn: D2L Training 4**” at College of Applied Medical Sciences, Majmaah University, Kingdom of Saudi Arabia (March 15, 2017).
- Attended the Workshop entitled “**How to prepare the Cognitive domain questions for Learning?**” at College of Applied Medical Sciences, Majmaah University, Kingdom of Saudi Arabia (March 7, 2017).
- Attended the Workshop entitled “**How to maximize D2L: Desire to Learn?**” at College of Applied Medical Sciences, Majmaah University, Kingdom of Saudi Arabia (February 22, 2017).
- Attended the Workshop entitled “**How to effectively implement various teaching strategies?**” at College of Applied Medical Sciences, Majmaah University, Kingdom of Saudi Arabia (February 16, 2017).
- Attended the Workshop entitled “**Course Evaluation Planning**” at College of Applied Medical Sciences, Majmaah University, Kingdom of Saudi Arabia (February 9, 2017).
- Attended the Workshop entitled “**How to prepare a Course Report?**” at College of Applied Medical Sciences, Majmaah University, Kingdom of Saudi Arabia (January 24, 2017).

- Attended the Workshop entitled “**The 1st Scientific day of Cancer Research at the College of Science**” in Zulfi, Kingdom of Saudi Arabia (April 13, 2017).
- Attended one day Symposium entitled “**Physical Therapy Management for Spasticity in Neurological Disorders**” organized by the Department of Physical Therapy and Health Rehabilitation in College of Applied Medical Sciences, Majmaah University, Kingdom of Saudi Arabia (December 14, 2016).
- Attended two days Symposium entitled “**Injuries Symposium, Prevention and Methods of Treatment and Rehabilitation**” held in College of Applied Medical Sciences, Majmaah University, Kingdom of Saudi Arabia (4–5 May, 2016).

SEMINAR PRESENTATIONS during PhD

- Post translational modifications.
- High-fat diets cause insulin resistance despite an increase in muscle mitochondria.
- The role of oxygen availability in embryonic development and stem cell function.
- Membrane proteomics of phagosomes suggests a connection to autophagy.
- A microRNA regulatory mechanism of osteoblast differentiation.
- Autophagy and metabolism.
- The dynamic nature of autophagy in cancer

LABORATORY SKILLS AND TECHNICAL EXPERTISE

- **Biochemical Techniques:** DNA, RNA and protein purification and estimation, thin layer chromatography, gel filtration chromatography, affinity chromatography, paper chromatography, UV-Vis. spectroscopic techniques, biochemical identification of mycobacterial strains.
- **Microbial Culture Techniques:** Culturing and maintenance of pathogenic and non-pathogenic cultures strains, plating methods, bacterial transformation, staining techniques such as Gram positive, negative and Acid Fast staining, Agar plate preparation, Colony Forming Units (CFU) enumeration, preparation of microbial cultures and use of laminar flow
- **Molecular biology and Proteomics techniques:** Plasmid isolation, isolation of genomic DNA from human blood, BLAST search for designing primers, polymerase chain reaction (conventional and reverse-transcriptase), cloning techniques, agarose gel electrophoresis, gel extraction and PCR product purification, restriction enzyme digestion and preparation of competent cells. SDS-PAGE, 2D-PAGE, western blotting, silver staining of proteins, mass spectrometry, MALDI-TOF
- **Immunological techniques:** ELISA (indirect, sandwich and peptide) and FACS, microscopy (light, inverted, fluorescence and scanning electron), cytotoxic T cell assay, estimation of various cytokines and chemokines, immunization of mice
- **Cell culture techniques:** Isolation and primary culture of peripheral blood mononuclear cells, splenocytes, neutrophils and peritoneal macrophages,

- **Animal Work:** Handling of experimental animals (mice, guinea pigs, rabbits), Immunization techniques, Infection of mice through various routes, blood collection techniques and dissection of mice. Collection and processing of different tissue and isolation of cells (splenocytes, neutrophils and peritoneal macrophages).

ACADEMIC REFERENCES

1. **Professor Wolf-Dieter Schubert**

Department of Biochemistry,
University of Pretoria, Hatfield 0028, South Africa.
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2. **Professor Sadhna Sharma**

Department of Biochemistry,
Postgraduate Institute of Medical Education and Research (PGIMER), Chandigarh-
160012, India
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3. **Professor Indu Verma**

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