Dr MUHAMMAD SALEEM

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Associate Professor
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HEC approved Supervisor# 66216

EDUCATION

PhD	The University of Manchester, UK, 2008, ***Biomolecular sciences***
MPhil	NIBGE, Quaid-i-Azam University, Islamabad, 2004, ***Biotechnology***
MSc	University of the Punjab, Lahore, 2002, ***Chemistry***
BSc	University of the Punjab, Lahore, 1999, ***Chemistry, Statistics, Zoology***

EMPLOYMENT

- School of Biological Sciences — Oct 2020- present
  University of the Punjab, Lahore

- Biodiscovery Institute, School of Pharmacy — Jan 2020- Sept 2020
  The University of Nottingham, UK

- Biological and Environmental sciences and Engineering Division
  King Abdullah University of Science and Technology — Sept 2017- Dec 2018
  Saudi Arabia

- Division of Structural biology and Medicinal Chemistry — Dec 2015-Sept 2017
  Centre for Biomolecular Sciences, School of Pharmacy
  The University of Nottingham, UK

- Leeds Institute of Cardiovascular and Metabolic Medicine — June 2013-Nov 2015
  School of Medicine
  University of Leeds, UK

- School of Biological Sciences, Faculty of Life Sciences — April 2008-May 2013
  The University of Manchester, UK

RESEARCH INTERESTS & EXPERIENCE

I have vast experience of working in World leading universities in the field of *Structural biology (protein crystallography and electron microscopy) and Biomolecular sciences with special focus on membrane proteins, and recombinant vaccine development*. During PhD, I have worked on structural proteomics of prokaryotic integral membrane proteins especially ATP binding cassette transporters and type IV pilus biogenesis system. At the University of Manchester, I have also worked on structural characterization of vaccine candidates of *Neisseria meningitidis* serogroup B in collaboration with University of Oxford. During my job at the University of Leeds I have worked in collaboration with the University of Nottingham, UK to study the novel mechanism of thrombosis that is crucial for the development of antithrombotic therapeutics. In King Abdullah University of Science and Technology, I have investigated the protein folding and impact of aggregation triggering motifs on the solubility and folding of proteins. Currently I am working as an Associate Professor at the School of Biological Sciences, University of the Punjab Lahore.

AWARDS/HONORS

- BBSRC and The University of Manchester sponsored studentship for PhD (2005-2008).
- Welcome Trust funded *Post-Doctoral* position by The University of Manchester (April 2008-April 2013).
- British Heart Foundation (BHF) funded *Post-Doctoral* position by the University of Leeds & University of Nottingham (June 2013- September 2017).

PROFESSIONAL MEMBERSHIPS

- Member of *Society of General Microbiology (SGM).*
- Member of *British Crystallographic Association (BCA).*
- Member of *British Society for Haemostasias & Thrombosis.*
- Held a membership of *Biochemical* Society.

COURSES/CONFERENCES/WORKSHOPS

- Attended CCP4/DLS "Data collection and Structure Solution Workshop" held from December13th to 20th 2016 at Diamond Light Source, Didcot, UK.
- Participated as an invited speaker for "2*nd International workshop on X-ray crystallography in Structural biology"* from held at FCC university, Lahore Pakistan from 15-19 October 2016.
- Participation in the annual meeting of British Society for Haemostasis & Thrombosis, UK Platelet Group & United Kingdom Haemophilia Centre Doctors Organization held at The Royal College of Surgeons of Edinburgh from 7-9 October 2014.
- Attended XVII BCA/CCP4 Summer School in Macromolecular Crystallography-September 5th to 11th 2010, University of Oxford, UK.
- Attended workshop on "Membrane Protein Crystallization and Crystallography" sponsored by EMBN-Train & E-MeP-Lab held at Diamond Light Source, Oxford, UK from 1st– 3rd April 2008.
- Attended CCP4 study weekends at the University of Leeds and University of Nottingham in 2007, 2008, 2010, 2011, 2014 and 2021.
- Attended 1st FEBS special meeting on "ATP-Binding Cassette (ABC) Proteins: From Multidrug Resistance to Genetic Disease" held in Innsbruck, Austria from 4-10th March 2006.
- Attended Core research facilities workshops for X-ray crystallography, Biomolecular analysis, Electron microscopy and NMR during PhD at The University of Manchester.
- Attended teaching demonstrator course and worked as a teaching demonstrator in Faculty of Life sciences at The University of Manchester from 2006-2008.

RESEARCH EXPERTISE

- Bioinformatics tools for molecular biology, genetic engineering and proteomics.
- Molecular biology and cloning to synthesize constructs for heterologous expression of recombinant proteins in bacterial, insect and mammalian expression systems.
- Membrane and soluble proteins expression, refolding and purification.
- Chromatographic systems including Akta Prime, Start and Purifier for size exclusion, ion exchange and hydrophobic separation of proteins.
- Protein characterization by SPR, SEC-MAL, CD, Fluorescence and UV spectroscopy.
- Electrophoretic techniques including SDS-PAGE, Native PAGE, Western blotting.
- Techniques to reconstitute immunologically important proteins.
- Electron microscopy, grid preparation and single particle averaging to determine low-resolution structure of proteins.
- Protein crystallization (manual, various automated robots including phoenix and

mosquito), Crystal optimization, seeding, cryo-protection.

- Diffraction data collection (regular trips to Diamond Synchrotron Source for in-house data collection since 2008, on-line remote data collection at The University of Manchester).
- X-ray Data processing to solve high-resolution structures of proteins using suits of software including imosflm, XDS, CCP4, Phenix, Coot, Pymol.
- Protein-protein interactions studies by ITC, SPR and Mass-spectrometry.

PROTEIN DATA BANK SUBMISSIONS

Following high-resolution protein structures have been solved and submitted to protein data bank (www.rcsb.org).

- **5DWZ** Structure of Condensing enzyme PqsBC (2016)
- **5AFP** Neuronal calcium sensor-1 (NCS-1) from *Rattus norvegicus* complex with rhodopsin kinase peptide from *Homo sapiens* (2015)
- **5AER** Neuronal calcium sensor-1 (NCS-1) from *Rattus norvegicus* complex with D2 dopamine receptor peptide from *Homo sapiens* (2015)
- **5AEQ** Neuronal calcium sensor-1 (NCS-1) from *Rattus norvegicus* (2015)
- **4AIP** The FrpB iron transporter from *Neisseria meningitidis*, F3-3 variant (2013)
- **4AIQ** The FrpB iron transporter from *Neisseria meningitidis*, F5-1 variant (2013)
- **4B7O** The FrpB iron transporter from *Neisseria meningitidis*, F5-1 variant apo- protein form (2013)
- **2WHN** N-terminal domain from the PilC type IV pilus biogenesis protein (2010)

PUBLICATIONS

Book Chapter

- **Muhammad Saleem,** Jeremy Moore, Jeremy P. Derrick. Expression, purification, and crystallization of *Neisserial* outer membrane proteins. *Neisseria meningitides: Advanced Methods and Protocols*. Springer Science + Business Media, LLC 2012 Chapter 6, pp. 96-106

Research articles

- Aston-Deaville S, Carlsson E, **Saleem M,** Thistlethwaite A, Chan H, Maharjan S, Facchetti A, Feavers I, Siebert C. A, Collins R, Roseman A and Derrick JP* (2020) An assessment of the use of Hepatitis B Virus core protein virus-like particles to display heterologous antigens from *Neisseria meningitidis* ***Vaccine*** 32(16) 3201-3209

- Juliet Morgan, **Muhammad Saleem**, Ruiqi, Caroline Armstrong, Szu Wong, Simon Caulton, Alice Fickling, Huw E.L. Williams, Adam Munday,José A. López, ,* Mark S. Searle* and Jonas Emsley (2019) Structural basis of the leukocyte integrin Mac-1 I-domain interactions with the platelet glycoprotein Ib. ***Blood Advances*** 3:1450-1459
doi: https://doi.org/10.1182/bloodadvances.2018027011

- **Muhammad Saleem**, Somayah Salah Qutub, Hepi Hari Susapto and Charlotte AE Hauser*. (2018) Impact of aggregation triggering ultrashort self-assembling peptide motifs on the solubility of proteins. *Frontiers in Nanoscience and Nanotechnology* 4(4): 1-6 doi: 10.15761/FNN.1000174

- **Muhammad Saleem**, Stephen M. Prince, Stephen Rigby, Muhammad Imran, Holly sanders, Hema Patel, Hannah Chan, Ian M. Feavers & Jeremy P. Derrick* (2013) Use of a molecular decoy to segregate transport from antigenicity in the FrpB iron transporter from *Neisseria meningitidis*. ***PlosOne*** 8(2) e56746

- Claire Jones, Manish Sadarangani, Susan Lewis, Isabelle Payne, **Muhammad Saleem**, Jeremy Derrick, Andrew Pollard (2016) Characterisation of the Immunomodulatory Effects of Meningococcal Opa Proteins on Human Peripheral Blood Mononuclear Cells and CD4+ T Cells. ***PlosOne*** 11(4) e0154153

- Sunil Maharjan, **Muhammad Saleem**, Ian M Feavers, Jun X Wheeler, Rory Care, Jeremy Derrick (2016) Dissection of the function of the RmpM periplasmic protein from *Neisseria meningitidis. Microbiology*. 162(2): 364-375

- Steffen Lorenz Drees, Chan Li, Fajar Prasetya, **Muhammad Saleem**, Ingrid Dreveny, Paul Williams, Ulrich Hennecke, Jonas Emsley, and Susanne Fetzner. (2016) PqsBC, a condensing enzyme in the biosynthesis of the *Pseudomonas aeruginosa* quinolone signal: crystal structure, inhibition, and reaction mechanism. *Journal of Biological Chemistry*. 291(13): 6610-6624

- Gunnstein Norheim; Holly Sanders; Jardar W Mellesdal; Idunn Sundfor; Hannah Chan; Carina Brehony; Caroline Vipond; Chris Dold; Rory Care; **Muhammad Saleem**; Martin C J Maiden; Jeremy P Derrick; Ian Feavers; Andrew J Pollard. (2015) An OMV Vaccine Derived from a Capsular Group B Meningococcus with Constitutive FetA Expression: Preclinical Evaluation of Immunogenicity and Toxicity. *PlosOne* 10(9) e0134353

- Sravan Pandalaneni, Vijaykumar Karuppiah, **Muhammad Saleem**, Lee P. Haynes, Robert D. Burgoyne, Olga Mayans, Jeremy P. Derrick, and Lu-Yun Lian (2015) Neuronal Calcium Sensor-1 Binds the D2 Dopamine Receptor and G-protein-coupled Receptor Kinase 1 (GRK1) Peptides Using Different Modes of Interactions. *Journal of Biological Chemistry*. 290(30): 18744-18756

- Ojas H Mehta; Gunnstein Norheim; J. Claire Hoe; Christine S Rollier, Ph.D.; Jerry C Nagaputra; Katherine Makepeace; **Muhammad Saleem**; Hannah Chan; David J. P. Ferguson; Claire Jones; Manish Sadarangani; Derek W. Hood; Ian Feavers; Jeremy P Derrick; Andrew J Pollard; E. Richard Moxon. (2014) Adjuvant effects elicited by novel oligosaccharide variants of detoxified meningococcal lipopolysaccharides on *Neisseria meningitidis* recombinant PorA protein: a comparison in mice. *PlosOne* 9(12) e115713

- J. C. Nagaputra, C. Rollier, M. Sadarangani, J. C. Hoe, O. Mehta, G. Norheim, **M. Saleem,** J. Derrick, H. Chan I. Feavers, A. Pollard, E. R. Moxon. (2014) *Neisseria meningitidis* native outer membrane vesicles containing different lipopolysaccharide glycoforms as adjuvants for meningococcal and non-meningococcal antigens. *Clinical and Vaccine immunology (CVI).* 21(2): 234-242

- **M. Saleem,** S. M. Prince, H. Patel, H. Chan, I. M. Feavers and J. P. Derrick. (2012) Refolding, purification and crystallization of the FrpB outer membrane iron transporter from *Neisseria meningitidis*. *Acta Cryst.* F**68**: 231-235

- **Saleem M**, Moore J, Derrick JP. (2012) Expression, purification, and crystallization of *neisserial* outer membrane proteins. *Methods in Molecular Biology*. 799: 91-106

- Karuppiah V, Hassan D, **Saleem M** & Jeremy P. Derrick. (2010). Structure and oligomerization of the PilC type IV pilus biogenesis protein from *Thermus thermophilus*. *Proteins Structure function and bioinformatics*, 78: 2049-2057

- Cleverley RM, **Saleem M,** Kean J, Ford RC, Derrick JP, Prince SM. (2008). Selection of membrane protein targets for crystallization using PFO-PAGE electrophoresis. *Molecular Membrane Biology*, 25(8): 625-630

- Collins RF, **Saleem M,** Derrick JP (2007). Purification and three-dimensional electron microscopy structure of the *Neisseria meningitidis* type IV pilus biogenesis protein PilG. *Journal of Bacteriology* 189: 6389-6396

- Munawar N., Anwar M.A., **Saleem M.,** Ghauri M. A. and Akhtar K. (2007). Biodepyritization of indigenous coal using acidophilic mesophilic and moderately thermophilic bacteria. *Pakistan Journal of Zoology,* 39(3): 147-151

- Perveen R, Rashid M.H, **Saleem M,** Khalid A.M and Rajoka M. I. (2006). Kinetic and Thermodynamic Properties of an Immobilized Glucoamylase from a Mesophilic Fungus, *Arachniotus citrinus. Protein and Peptide Letters*. 13(7): 665-6671

- **Saleem M,** Rashid M.H, Jabbar A, Perveen R, Khalid A.M and Rajoka M. I. (2005). Kinetic and thermodynamic properties of immobilized endoglucanase from *Arachniotus citrinus*. *Process Biochemistry* 40(2): 849-855

- Jabbar, A., Ghafoor, M.Y., **Saleem, M.,** Amanullah, Malana, M.A., Niaz, M. and Rashid, M.H. (2004): Kinetics of stability of fungal carboxymethylcellulases to proteolytic nicking. *Int. J. Biol. Biotech*. 1: 319-323

- Jabbar, A., Rashid, M.H., Malana, M.A., Amanullah, **Saleem, M.,** Niaz, M. and Yasin, M.Z. (2004): Kinetic and thermal stability of soluble and immobilized carboxymethylcellulases from *Arachniotus citrinus*. *Int. J. Biol. Biotech.*1: 239-246

- Jabbar, A., Rashid, M.H., Malana, M.A., Amanullah, **Saleem, M.,** Niaz, M. and Yasin, M.Z. (2004): Immobilization of fungal carboxymethylcellulases by Gel entrapment and its impact on operational stability. *Int. J. Biol. Biotech*. 1: 233-237

CONFERENCES/ABSTRACTS/PRESENTATIONS

- **M. Saleem,** S. Prince, S. Rigby, M. Imran, H. Patel, H. Chan, H. Sanders, M. Maiden, I. Feavers, **J. Derrick***. The structure, specificity and antigenicity of the FrpB iron transporter from *Neisseria meningitides*. Paper presented in XVIIIth International pathogenic *Neisseria* Conference (IPNC) held at Wurzburg, Germany from 09-14 September 2012.

- S. Maharjan*, **M. Saleem,** J. Derrick, I. Feavers R. Care. Structure and function of RmpM from *Neisseria meningitides*. Poster presented at XVIIIth International pathogenic *Neisseria* Conference (IPNC) held in Wurzburg, Germany from 09-14 September 2012.

- C. Rollier*, J. C. Nagaputra, M. Sadarangani, J. C. Hoe, O. Mehta, G. Norheim, **M. Saleem,** J. Derrick, H. Chan I. Feavers, A. Pollard, E. R. Moxon. *Neisseria meningitidis* native outer membrane vesicles containing modified LPS have an adjuvant effect for meningococcal, non-meningococcal proteins, and polysaccharide antigens. Poster presented at XVIIIth International pathogenic *Neisseria* Conference (IPNC) held in Wurzburg, Germany from 09-14 September 2012.

- L. Marsay*, C. Dold, Y. Yamaguchi, K. Makepeace, G. Paterson, **M. Saleem**, J. Derrick, I. Feavers, M. Maiden, D. Wyllie, A. Hill, A. Pollard and C. Rollier. PorA-expressing adenovirus vectors as vaccines against serogroup B *Neisseria meningitidis*. Paper presented in XVIIIth International pathogenic *Neisseria* Conference (IPNC) held at Wurzburg, Germany from 09-14 September 2012.

- O. Mehta*, G. Norheim, J. C. Hoe, K. Makepeace, **M. Saleem,** H. Chan, D. Ferguson, C. Jones, M. Sadarangani, D. Hood, I. Feavers, J. Derrick, A. Pollard, E. R. Moxon. Evaluation of the adjuvant effects of novel meningococcal detoxified lipopolysaccharide structures formulated in native outer membrane vesicles. Poster presented at 17th

International pathogenic Neisseria Conference (IPNC) held in Banff, Alberta, Canada from the 11–16 September 2010.

- **M. Saleem*,** R. M. Cleverley, R. C. Ford, S. M. Prince, J. P. Derrick. Towards more structures of bacterial ABC transporters. Poster presented at "ATP-Binding Cassette (ABC) Proteins: From Multidrug Resistance to Genetic Disease" 1st FEBS special meeting held in Innsbruck, Austria on 4-10 March 2006.

- **Saleem, M**; Anwar, M. A; Ghauri, M. A; Akhtar, K; Rehman, M; Hafeez, F. Y. and Khalid, A. M. Development of Polyclonal Antibodies Against MT13 Strain of *Sulfobacillus thermosulfidooxdans* and Determination of their Specificity. Poster presented at "International Thermophiles 2003 Conference" held at Exter, UK, from 15-19 September. Pp. 115

- Munir A. Anwar, **Muhammad Saleem**, Sakandar Rauf, M. Afzal Ghauri, Hina Tabassum, Kalsoom Akhtar, Moazur Rehman, and Ahmad M. Khalid. Effect of cyanide ions on the oxidation of various energy sources by acidophilic chemolithotrohic bacteria. Paper presented at the "7th International Conference on Trends in Biochemistry and Molecular Biology" held at University of the Punjab, Lahore, Pakistan, from April 2-5, 2003. pp. 91-92

- Munir A. Anwar, **M. Saleem**, M. Tausif Chaudhry, Kalsoom Akhtar, Moazur Rehman, Sohail Hameed, M. A. Ghauri, and Ahmad M. Khalid. Bacterial adhesion to mineral surfaces during pyrite biooxidation. Poster presented at the "7th International Conference on Trends in Biochemistry and Molecular Biology" held at University of the Punjab, Lahore, Pakistan, from April 2-5, 2003. pp. 48

- **Saleem M**, Rashid M.H, Jabbar A, Perveen R, Khalid A.M and Rajoka M.I. Kinetic and Thermodynamic Properties of Immobilize Endoglucanase from *Arachniotus citrinus* Poster presented for presentation at "4th International and 14th National Chemistry Conference" May 16-18, 2004 PCSIR Lahore. pp. 211-212

- **Saleem, M**; Anwar, M. A; Ghauri, M. A; Akhtar, K; Rehman, M; Hafeez, F. Y. and Khalid, A. M. Development of polyclonal antibodies for the identification of locally isolated acidophilic bacteria. Paper presented at "4th International and 14th National Chemistry Conference" May 16-18, 2004 PCSIR Lahore. pp. 240-241.

- Anwar, M. A; Ghauri, M. A; **Saleem, M**; Akhtar, K; and Khalid, A. M. Biodesulfurization of indigenous fossil fuels. Paper presented at "First National Conference on Industrial and Environmental Biotechnology" held on 29-30 September 2004 at Islamabad, Pakistan. pp. 34

- Anwar, M. A; **Saleem, M**; Ghauri, M. A; Akhtar, K; and Khalid, A. M. Serological and Molecular Characterization Of Locally Isolated Acidophilic Chemolithotrophic Bacteria Used in Coal Heap Desulfurization. Accepted for presentation at "Extremophiles (An ASM Conference) in Cambridge, Maryland" held on September 19 – 23, 2004.

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