Dr. Nayab Batool, Ph.D.

Postdoctoral Researcher
School of Medicine, Sungkyunkwan University
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WORK EXPERIENCE

Postdoctoral researcher at School of Medicine, Sungkyunkwan University (Currently)

Assistant Professor, Institute of Microbiology, University of Agriculture, Faisalabad, Pakistan (March 2021-February 2025)

EDUCATIONAL QUALIFICATION

Doctor of Philosophy form Sungkyunkwan University (Ph.D. September 2016-February 2021):

- Thesis "Investigating a novel lysostaphin resistance mechanism of *Staphylococcus aureus* and a nanobiotechnology-based new antibacterial strategy" under the guidance of Professor Kyeong Kyu Kim (Thesis submitted in December 2020, Awarded in February 2021).

- Studied Molecular Microbiology related Infectious Disease, Antimicrobial Resistance (AMR) from Department of Molecular Cell Biology, Sungkyunkwan University (SKKU), South Korea.

- Identification of serine hydroxymethyl transferase (SHMT) as a high potential virulence factor in *S. aureus* (First Report).

- Identification of novel antivirulence drug for AMR flesh-eating bacteria, *Vibrio vulnificus*.

- Design, synthesis of radiofrequency sensing nano-biorobot for the physical noninvasive physical & targeted antibacterial therapy against hypervirulent multidrug resistant *S. aureus* and its evaluation in mice infection model.

Master of Philosophy in Microbiology from University of Agriculture (M. Phil September 2014-September 2016):

- Thesis "*Antimicrobial efficacy of silver nanoparticles against pathogenic strains of Escherichia coli and Klebsiella pneumoniae*" under the guidance of Professor Sajjad-ur-Rahman (Retd. Director, Institute of Microbiology) (Thesis submitted in July 2016, Awarded in September 2016).

- Synthesis of silver nanoparticles by biological reduction of silver nitrate using fruit extract of *Capsicum annuum*
- Evaluation of minimum inhibitory concentration of synthesized nanoparticles against *Escherichia coli* and *Klebsiella pneumoniae*

Doctor of Veterinary Medicine from Bahauddin Zakariya University, Multan (DVM September 2009-August 2014):

SKILLS

A. Genome Sequencing and analysis of AMR landscape: Illumina sequencing and genome assembly and analysis to identify the novel AMR mechanism. (GenBank Accession no. JACSIU000000000.1 and JACORE000000000.1).

B. Identification of novel virulence factor from pathogenic bacteria and its small molecule by drug repositioning: Novel virulence and antibiotic resistance gene (*shmt*). High throughput screening of drug chemical library and drug repositioning (2, 4 DHC for *Vibrio vulnificus*).

C. Recombinant DNA Technology: Cloning and expression of genes in pathogenic *Staphylococcus, E. coli CFT073* and *V. vulnificus.*

a. **Gene Transfer method:** Natural transformation, Type I restriction inhibitor-based electroporation, phage mediated gene transfer in *S. aureus* USA300.

b. **Gene deletion/integration method (Knockout/knock-in) methods:** General homologous recombination method, Lambda red recombinase system in *E. coli* CFT073.

D. Gene expression: Semi-quantitative and quantitative RT-PCR

E. Physiology and Biochemistry: Physiology and biochemistry of pathogenic bacteria

F. Proteomics: SDS-PAGE, protein identification, reverse genetics, recombinant protein overexpression and antibody generation, Western blotting, and Immuno-detection

G. Protein purification. Affinity chromatography based recombinant protein purification (cell wall binding domain of endolysin and *metJ*)

H. Microscopy: Light and Fluorescence microscopy, Confocal microscopy, Electron Microscopy (SEM and TEM), Atomic force Microscopy (AFM), Histopathology

I. Nanobiotechnology: Nano-biorobot for the physical noninvasive physical & targeted antibacterial therapy against hypervirulent multiple drug-resistant *S. aureus* and its evaluation in insect and mice infection model

RESEARCH GRNATS AS PI AND COPI

PI

- Standardization and development of ready to use kit for detection of vancomycin resistant *Staphylococcus aureus*, Endowment Fund Secretariat, 1.874 million PKR (Ongoing)

COPI

- Gene Editing of Biological Agents for Nutritional, Biochemical, and therapeutic purposes by Ministry of Science & Technology (MoST), Islamabad, 500 million PKR (Ongoing)

- MD-TSPM: Thermal Stability Prediction Method for Cancer Associated I-motifs Endowment Fund Secretariat, 1.9 million PKR (Completed)

FELLOWSHIPS AND AWARDS

- Awarded with International student scholarship by Sungkyunkwan University (2016-2018)

- Awarded with fully funded Ph.D. scholarship by Faculty Development Project, University of Agriculture, Faisalabad (2016-2021)

- Received University Merit Scholarship in M. Phil program (2014-2016)

- Awarded with Punjab Educational Endowment Fund in M. Phil program (2014-2016)

LIST OF PUBLICATIONS IN SCIENTIFIC JOURNAL

RESEARCH ARTICLES

1. Saba Imdad, **Nayab Batool**, Subhra Pradhan, Akhilesh Kumar Chaurasia and Kyeong Kyu Kim*, Identification of 2´,4´-Dihydoxychalcone as an Antivirulence Agent Targeting HlyU, a master Virulence Regulator in *Vibrio vulnificus*, *Molecules*, 2018.

2. Jin-Hahn Kim, Akhilesh Kumar Chaurasia, **Nayab Batool**, Kwan Soo Ko and Kyeong Kyu Kim*, Alternative Enzyme Protection Assay To Overcome the Drawbacks of the Gentamicin Protection Assay for Measuring Entry and Intracellular Survival of Staphylococci, *Infection and Immunity*, 2019.

3. **Nayab Batool**, Kwan Soo Ko, Akhilesh Kumar Chaurasia and Kyeong Kyu Kim*, Draft Genome Sequences of Lysostaphin-Resistant (K07-204) and Lysostaphin-Susceptible (K07-561) *Staphylococcus aureus* Sequence Type 72 Strains Isolated from Patients in South Korea, *Microbiology Resource Announcements*, 2020.

4. **Nayab Batool**, Kwan Soo Ko, Akhilesh Kumar Chaurasia and Kyeong Kyu Kim*, Functional Identification of Serine Hydroxymethyltransferase as a Key Gene Involved in

Lysostaphin Resistance and Virulence Potential of *Staphylococcus aureus* Strains, *International Journal of Molecular Sciences*, 2020.

5. **Nayab Batool**, Amen Shamim, Akhilesh Kumar Chaurasia and Kyeong Kyu Kim*, Genome-wide Analysis of *Staphylococcus aureus* Sequence Type 72 Isolates Provides Insights into Resistance Against Antimicrobial Agents and Virulence Potential, *Frontiers in Microbiology*, 2021.

6. **Nayab Batool**, Seokyoung Yoon, Saba Imdad, Minsuk Kong, Hun Kim, Sangryeol Ryu, Jung Heon Lee, Akhilesh Kumar Chaurasia and Kyeong Kyu Kim*, An Antibacterial Nanorobotic Approach for the Specific Targeting and Removal of Multiple Drug-Resistant *Staphylococcus aureus*, *Small*, 2021.

7. Hafiza Azka Mumtaz, Unsa Saleem, Arif Muhammad and **Nayab Batool***, Investigation of antibiotic resistance and biofilm formation ability of *Acinetobacter baumannii* isolated from urinary catheters, *Pakistan Journal of Medical Sciences*, 2024.

BOOK CHAPTERS

1. Muhammad Khurram, Rida Khalid, Safia Ehsan, Muqdas Fatima, Hafiza Azka Mumtaz, Unsa Saleem, Fatima Sarwar and **Nayab Batool***, Epidemiology of Zoonotic Tuberculosis and its Implications in Asia, 2023.

2. Tehreem Rana, Ayesha Sarwar, Afaq Mahmood, **Nayab Batool***, Riffat Shamim, Sehrish Gul, Iqra Arshad, Fariha Iftikhar, Abdullah Ali and Fatima Sarwar, Molecular Techniques Used for Diagnosis of Zoonotic Diseases, 2023.

3. Muqdas Fatima, Safia Ehsan, Rida Khalid, Muhammad Khurram, Samran Ahmad, Asma Ihtasham-ul-Haq, Noor-ul-Huda, Riffat Shamim Aslam and **Nayab Batool***, Use of Prebiotics and Probiotics to Improve Gut Health in Pregnant Women, 2024.

4. Rida Khalid, Muhammad Khurram, Safia Ehsan, Muqdas Fatima, Muhammad Junaid Akber, Asma Ihtasham-ul-Haq, Noor-ul-Huda, Fatima Sarwar and **Nayab Batool***, Innovative Nanomaterials: Applications and Challenges in Molecular Diagnostics, 2024.

5. Fatima Sarwar, Afaq Mahmood, Ayesha Sarwar, Tehreem Ajmal Rana, **Nayab Batool**, Sara Mahmood, Gul Naz, Abdullah Ali, Muhammad Umar Zafar Khan and Riffat Shamim Aslam, Nanotechnology: A Synergistic Approach for Enhanced Therapeutic Outcomes in Alternative Medicine, 2024.

PATENT

PCT/KR2021/017267

SCIENTIFIC COMMUNICATIONS IN CONFERENCES

1. Oral Presentation on International symposium on Nanobiology: Integrating Nanotechnology & Microbiology for Sustainable Future (ISNB2024), IOM, GCUF, February 28-29, 2024.

2. Poster presentation "Functional Identification of Serine Hydroxymethyltransferase as a Key Gene Involved in Lysostaphin Resistance and Virulence Potential of *Staphylococcus aureus* Strains at Global Antibiotic research and Development Partnership (GARDP & BSAC) at Antimicrobial Chemotherapy Virtual Conference (ACC) February 2, 2022.

3. Targeting microbial metabolism to combat the AMR in *Staphylococcus aureus,* Akhilesh Kumar Chaurasia, **Nayab Batool**, and Kyeong Kyu Kim, in JPIAMR Therapeutics Workshop 2021: Feeding the Antimicrobial Pipeline.

4. Member of organizing committee of the workshop held at School of Medicine, Sungkyunkwan University (SKKU), Suwon, South Korea, during December 4-5, 2019, focus at "*JPIAMR Workshop in Asia: Fostering knowledge on Clinical Epidemiology, AMR policy, Therapeutics and Diagnostics to combat AMR in Asia*"

5. Nanobiorobotic based Antibacterial Approach for Targeted Eradication of Multiple Drug-Resistant *Staphylococcus aureus,* **Nayab Batool**, Saba Imdad, Seokyoung Yoon, Jung Heon Lee, Akhilesh Kumar Chaurasia, and Kyeong Kyu Kim, in CLINAM 11 European and Global Summit for Clinical Nanomedicine, Targeted delivery and Precision Medicine-The Building Block to Personalized Medicine, 2018.

GUIDED MASTERS STUDENTS

(Degree awarded)

1. Faiqa Fateh
2. Unsa Saleem
3. Hamza Shahid
4. Maham Mustafa
5. Hafiza Azka Mumtaz
6. Rida Khalid
7. Muqadas Fatima
8. Samran Ahmad
9. Muhammad Khurram
10. Safia Ehsan

(Degree Ongoing)

1. Asma Ehtsham
2. Sana Parveen
3. Muhammad Ukasha Ahmer
4. Muhammad Junaid Akber
5. Noor Ul Huda

COURSE TEACHING (BS, M. PHIL, PH.D. STUDENTS) IN ENGLISH