Khushi Doshi

Biological sciences (Masters) · Chemical Engineering (Bachelors)

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Education

Birla Institute of Technology and Science, Pilani, Rajasthan — *GPA: **9.01 (Dept.)** / **8.34 (Overall)***

M.Sc. in *Biological Sciences* — *Aug. '18 – July '23*

Birla Institute of Technology and Science, Pilani, Rajasthan — *GPA: **8.68 (Dept.)** / **8.34 (Overall)***

B.E. in *Chemical Engineering* — *Aug. '18 – July '23*

Publications & Pre-prints

Ultrasensitive and Long-Lasting Luminescence Cascade Sensor for Point-of-Care Viral Pathogen Detection

S. Kim, G. Cho, J. Lee, **Khushi Doshi**, S. Gharpure, H. Chen, J.M. Hardie, H. Shafiee — *2023*

In Submission at Nature Biomedical Engineering

COVID-19 Pandemic: Mechanism, Diagnosis and Treatment

V. Kumar, **Khushi Doshi**, W. H. Khan, Anurag Singh Rathore — *2020*

Journal of Chemical Technology & Biotechnology

Work Experience

In-Vitro Anti-Cancer Drug Discovery — *Research Associate*

Glenmark Pharmaceuticals — *Feb '24 – present*

- Conduct literature review to understand IL-1R/TLR signaling pathways and study IRAK-M inhibitors as immune modulators that increase the expression of proinflammatory cytokines in myeloid cells, enhancing the cytotoxicity of T-lymphocytes for effective cancer-immunotherapy
- Perform biochemical assays, such as HTRF and WRN helicase, to screen therapeutic compounds with high efficacy against cancer targets
- Test cancer cells with different concentrations of selected compounds to plot dose-response curve and evaluate parameters like cytotoxicity and IRAK-M degradation. Perform ELISAs to measure IL-12 expression in drug-treated versus untreated cells. Also test drug effects on ex-vivo cultures

Ultrasensitive Antigen-Based Point-of-Care Diagnostics — *Thesis*

Prof. Hadi Shafiee | Harvard Medical School | Brigham and Women's Hospital — *July '22 – June '23*

- Developed and optimized LUCAS- LUminescence CAscade-based Sensor, an enzyme cascade system capable of rapidly detecting analytes with ultrahigh sensitivity and prolonged bioluminescence
- Actively engaged in troubleshooting the challenges faced during assay development. Helped implement it on a fully automated, portable and user-friendly platform featuring a microfluidic cartridge with pre-loaded reagents and a cost-effective reader
- Achieved over 95% accuracy in the qualitative classification of 177 viral-infected patient samples and 50 viral-spiked serum samples, for various respiratory viruses and blood-borne pathogens including SARS-CoV-2, HIV, HBV, and HCV
- Implemented the protocol for testing HBV. Selected antibody pairs and target antigen and carried out bioconjugation reactions of nanoparticles and immunogens. Achieved a limit of detection of 0.4 fM for HBV surface antigen and a clinical sensitivity of 100% and specificity of 92% for HBV patient samples

Microfluidic Platforms for Droplet Synthesis — *Remote Internship*

Prof. Uday Kompella | University of Colorado Denver — *June '21 – Aug '21*

- Designed a solvent extraction channel, with 4 inlets, a fusion chamber and a collection reservoir. Simulated the mixing of silicone oil, water and DCM in the chip to generate droplets in Ansys Fluent
- Performed the mixing of silicone oil and water in a T-chip. Modified the design and added a laminated water stream in order to extract droplets from the oil phase and collect them in aqueous phase
- Created a parametric model of a 3-inlet microfluidic channel in AutoCAD. Simulated the mixing of aqueous PVA and PLGA dissolved in acetone by varying flow parameters in Autodesk CFD

Fruit Fly – Biology and Behavior — *Remote Internship*

Prof. Adelaine Leung | University of Saskatchewan — *June '21 – Aug. '21*

- Conducted manual analysis of fly behavioral videos, documenting copulation periods, alignment during copulation, and unique postures. Also performed the above analysis utilizing Caltech FlyTracker software
- Developed a MATLAB code that processed the output files from the FlyTracker software, analyzing the start and end times of copulation based on a threshold value of distance between two flies
- Worked with JAABA, a machine learning-based behavioral annotator, to understand how to train classifiers for automated analysis of fly behaviors

Prototyping of Portable Centrifuge and Reagent Strip Quantification

Internship | P

Prof. Rohit Srivastava | Indian Institute of Technology Bombay — *May '19 – July '19*

- Designed a 3-D model of a lateral flow assay reader and portable centrifuge of 10,000 RPM using AutoCAD and 3-D printed the designs using the Ultimaker-3 printer as a part of a bigger project for remote healthcare
- Resolved the challenges of unwanted vibrational stresses using absorber rubber pads and measured the centrifuge speed by integrating a photosensor and frequency-to-analog converter
- Prepared reagent strips and solutions of albumin, creatinine and glucose and quantified them using light sensors

Selected Academic Projects

Genetic Engineering Techniques

Lab Course

Prof. Prabhat N. Jha | BITS Pilani — *Jan. '20 – May '20*

- Isolation of plasmid from pQE60 clone of E. coli by boiling lysis, alkaline lysis and kit based methods, restriction-digestion of isolated plasmid and analysis using agarose gel electrophoresis followed by DNA extraction, purification and quantification using Nanodrop
- Performed competent cells preparation of E. coli, transformation using PuC19 vector followed by DNA ligation, creation of recombinant clones and their selection by blue-white screening

Biomarkers of Ovarian Cancer

Design Project

Prof. Rajdeep Chowdhury | BITS Pilani — *Aug. '20 – Dec. '20*

- Undertook an in-depth study on ovarian cancer, analyzing treatment approaches, drug repurposing strategies, mechanisms of drug tolerance and resistance, collateral sensitivity and FDA-approved biomarkers used for detection
- Worked on identifying molecular signatures and created database for the machine learning team, enabling them to develop a cognitive model that can predict ovarian cancer and the patient's response to therapy

Comparative Genomics of the ATR Gene

Lab Course

Prof. Shibasish Chowdhury | BITS Pilani — *Jan. '21 – May '21*

- Analyzed the ATR gene from various organisms. Wrote python scripts to examine gene content, restriction enzymes sites and start/stop codons. Used GOR4, Predator and Predict Protein to predict and visualize the secondary and 3D protein structures
- Predicted structural and functional regions using GENSCAN and used ORF Finder to obtain the ORFs and protein sequences
- Performed pairwise amd multisequence alignments (EMBOSS, BLAST, Clustal Omega) and phylogenetic tree constructions (MEGA-X) to gain insights into evolutionary and functional relationships and sequence conservation among organisms

Skills

Wet Lab	Mammalian Cell Culture (Seeding, Splitting, Revival, Drug Treatment, Cryopreservation), HTRF, ELISA, WRN Helicase Assay, CTG Assay, Gel Electrophoresis, Molecular Cloning Techniques, Biosafety and Handling Patient Samples (BSL2+ Compliance), Physiological and Biochemical Characterization of Microbial Cultures
Instruments	Spectrometers (UV-Vis, Fluorescence Spectrometer, FT-IR), TLC, Gas Chromatography, Luminometer
Software	ImageJ, AutoCAD, Ansys Fluent, Basic Programming (MATLAB, Python, C), Serial Cloner Software

Achievements

Aug. '22	**IPCD Travel Grant Award,** One of the 10 students in the '23 batch to receive Grant for Off-Campus Thesis	*BITS Pilani*
Jan. '20	**MCN Scholarship,** Awarded the Merit-cum-Need Scholarship to cover 25% of tuition for the Semester	*BITS Pilani*
2018	**Dual Degree Program Selection,** Selected for B.E. Chemical with MSc. Biological Sciences at BITS Pilani, Pilani Campus (Acceptance Rate 1.47%)	*BITS Pilani*
2015	**Dr. Homi Bhabha Balvaidnyanik Competition,** Earned a Silver Medal at the State Level	*High School*

Certified Courses

Aug. '20	**Biology Meets Programming : Bioinformatics for Beginners,** UC San Diego	*Coursera*
Jun. '20	**MATLAB Onramp,** MathWorks	*MathWorks*
May. '20	**Introduction to the Biology of Cancer,** Johns Hopkins University	*Coursera*