ASHOK KUMAR SHARMA

CONTACT INFORMATION

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Codes availability: https://github.com/ashoks773

EDUCATION

PhD in Bioinformatics **Dec 2012 - Jan 2018**
IISER Bhopal, Madhya Pradesh, India

- Advisor: Dr. Vineet Kumar Sharma
- **Thesis work**: Development of machine learning-based computational pipelines for the analyses of high-throughput multi-omics datasets.

Masters in Pharmacoinformatics **Dec 2010 - Jan 2012**
NIPER Mohali, Punjab , India

- Advisor: Prof. Prasad V. Bharatam
- **Thesis**: Modelling and Designing of Glycogen Synthase Kinase 3 Inhibitors.

Bachelor of Pharmacy **Aug 2006 - June 2010**
Dr. H. S. Gour University, Sagar, Madhya Pradesh, India

RESEARCH EXPERIENCE

Postdoctoral Scientist
Casero Lab, Cedar Sinai Medical Hospital **Feb 2021 - Present**
Advisor: Dr. David Casero, *Director, Translational Multiomics, Inflammatory Bowel Immunobiology Research Institute*
Co-Advisor: Dr. Suzanne Devkota, *Director of Microbiome Research at the F. Widjaja Foundation Inflammatory Bowel and Immunobiology Research Institute*

Broadly, I am involved in the analysis and integration of multi-omics datasets to identify pathogenic factors in IBD. Provided below is the list of my current projects.

- Quantification of bacterial growth rates from metagenomic datasets to identify bacterial activities associated with the progression of Crohn's disease.
- Alterations/reprogramming of cell-specific gene expression in the host epithelium of UC patients that undergo IPAA surgery and develop pouchitis.
- Analysis of Genomics(sinle cell RNAseq), proteomics, metabolomics and Imaging Mass Cytometry (IMC) data types to uncover microbial regulation of immune responses of creeping fat in Crohn's disease.

Postdoctoral Associate
Microbiomics Lab, University of Minnesota **March 2018 - Feb 2021**
Mentor: Dr. Andres Gomez

Being the first computational hire in the department, I was responsible for maintaining and setup computational pipelines on a high-performance computing facility at UMN. And, I have actively contributed to the following projects.

- Multi-omics data analysis and integration to understand the effect of diet/lifestyle on gut microbial taxonomic and functional compositions in traditional human and nonhuman primate populations.
- Data mining and systems biology approaches to identify potential microbial targets (enzymes/proteins)
- Identification of gastrointestinal gene expression patterns in response to the functional alteration in the gut microbiome using meta-transcriptomic data analysis.

Junior/Senior Research Fellow (J/SRF)
MetaBioSys Lab, IISER Bhopal **Dec 2012 - Jan 2018**
Mentor: Dr. Vineet Kumar Sharma
As a graduate researcher, I have contributed to the following projects:

- Development of machine learning-based computational pipelines for the analysis of large-scale genomic and metagenomic datasets.
- High-throughput predictions of gut microbial-mediated drug metabolism and toxicity using chemical structure-centric approaches.
- Machine learning-based models for the identification of taxonomic, functional, and metabolic markers associated with colorectal cancer patients in India.

Journal Publications

1. Dina G. Moussa, **Sharma, A.K.**, Tamer Mansour, Bruce Witthuhn; Jorge Perdigao; Joel D. Rudney; Conrado Aparicio; Andres Gomez. Functional Biomarkers of Ex-vivo Dental Caries Onset. **eBioMedicine 2022** [**Under Review**].

2. Rosa, F., **Sharma, A.K.**, Gurung, M., Casero, D., Matazel, K., Bode, L., Simecka, C., Elolimy, A.A., Tripp, P., Randolph, C. and Hand, T.W., **2022**. Human Milk Oligosaccharides Impact Cellular and Inflammatory Gene Expression and Immune Response. **Frontiers in Immunology.** 13: 907529. doi: 10.3389/fimmu.

3. Saxena, R., Prasoodanan PK, V., Gupta, S., Gupta, S., Waiker, P., Samaiya, A., **Sharma, A.K.** and Sharma, V.K., **2022**. Assessing the effect of smokeless tobacco-consumption on oral microbiome in healthy and oral cancer patients. **Frontiers in Cellular and Infection Microbiology**, p.331.

4. **Sharma, A.K.**, & Sam Davison; Barbora Pafco; Jonathan B. Clayton, Jessica M. Rothman, Matthew R. McLennan, Marie Cibot, Terence Fuh, Roman Vodicka, Carolyn Jost Robinson, Klara Petrzelkova, and Andres Gomez, **2022**. The primate gut mycobiome bacteriome interface is impacted by environmental and subsistence factors. **npj Biofilms Microbiomes** 8(1), pp.1-11.

5. Vishnu Prasoodanan P K, & **Ashok K Sharma**, Shruti Mahajan, Darshan B Dhakan, Abhijit Maji, Joy Scaria, Vineet K Sharma, **2021**. Western and non-western gut microbiomes reveal new roles of Prevotella in carbohydrate metabolism and mouth-gut axis. **npj Biofilms Microbiomes**, Oct 7;7(1):77.

6. **Sharma, A.K.**, & Petrzelkova, K., Pafco, B., Robinson, C.A.J., Fuh, T., Wilson, B.A., Stumpf, R.M., Torralba, M.G., Blekhman, R., White, B. and Nelson, K.E., Leigh S.R., Gomez A, **2020**. Traditional human and nonhuman primate populations show parallel gut microbiome adaptations to analogous dietary conditions. **mSystems**, 5(6).

7. **Sharma, A.K.**, & Debusk, W.T., Stepanov, I., Gomez, A. and Khariwala, S.S, **2020**. Oral microbiome profiling in smokers with and without head and neck cancer reveals variations between health and disease. **Cancer Prevention Research**, 13(5), pp.463-474.

8. Gupta, A., Dhakan, D.B., Maji, A., Saxena, R., PK, V.P., Mahajan, S., Pulikkan, J., Kurian, J., Gomez, A.M., Scaria, J. and Amato, K.R., **Sharma, A.K.** and Sharma V.K, **2019**, Association of Flavonifractor plautii, a flavonoid degrading bacterium, with the gut microbiome of colorectal cancer patients in India. **mSystems**, 4(6).

9. Gomez, A.*, **Sharma, A.K.***, Mallott, E.K., Petrzelkova, K.J., Robinson, C.A.J., Yeoman, C.J., Carbonero, F., Pafco, B., Rothman, J.M., Ulanov, A. and Vlckova, K, **2019**. Plasticity in the human gut microbiome defies evolutionary constraints. **mSphere**, 4(4), pp.e00271-19.

10. **Sharma, A.K.**, Pafčo, B., Vlčková, K., Červená, B., Kreisinger, J., Davison, S., Beeri, K., Fuh, T., Leigh, S.R., Burns, M.B. and Blekhman, R., Gomez, A, **2019**. Mapping gastrointestinal gene expression patterns in wild primates and humans via fecal RNA-seq. **BMC genomics**, 20(1), p.493.

11. Dhakan, D.B., Maji, A., **Sharma, A.K.**, A.K., Saxena, R., Pulikkan, J., Grace, T., Gomez, A., Scaria, J., Amato, K.R. and Sharma, V.K, **2019**. The unique composition of Indian gut microbiome, gene catalogue, and associated fecal metabolome deciphered using multi-omics approaches. **GigaScience**, 8(3), p.giz004.

12. Kumar, K., Dhoke, G.V., **Sharma, A.K.**, Jaiswal, S.K. and Sharma, V.K., **2019**. Mechanistic elucidation of amphetamine metabolism by tyramine oxidase from human gut microbiota using molecular dynamics simulations. **Journal of cellular biochemistry**, 120(7), pp.11206-11215.

13. **Sharma, A.K.**, Jaiswal, S.K., Chaudhary, N. and Sharma, V.K., **2017**. Prediction of species-specific biotransformation of xenobiotic/drug molecules by the human gut microbiota. **Scientific reports**, 7(1), pp.1-13.

14. **Sharma, A.K.**, Srivastava, G.N., Roy, A. and Sharma, V.K., **2017**. ToxiM: A toxicity prediction tool for small molecules developed using machine learning and chemoinformatics approaches. **Frontiers in pharmacology**, 8, p.880.

15. Gupta, A., Kumar, S., Prasoodanan, V.P., Harish, K., **Sharma, A.K.** and Sharma, V.K., **2016**. Reconstruction of bacterial and viral genomes from multiple metagenomes. **Frontiers in microbiology**, 7, p.469.

16. Chaudhary, N., **Sharma, A.K.***, Agarwal, P., Gupta, A. and Sharma, V.K., **2015**. 16S classifier: a tool for fast and accurate taxonomic classification of 16S rRNA hypervariable regions in metagenomic datasets. **PLOS One**, 10(2), p.e0116106.

17. **Sharma, A.K.**, Gupta, A., Kumar, S., Dhakan, D.B. and Sharma, V.K., **2015**. Woods: a fast and accurate functional annotator and classifier of genomic and metagenomic sequences. **Genomics**, 106(1), pp.1-6.

Conference publications

1. **Sharma, A.K.**, Martin, A., Moskowitz, J.E., Bora, S., Legree, K., Dorrestein, P., Underhill, D., Knight, R., Chen, P. and Devkota, S., 2022. 1166: In-patient antibiotic exposure promotes sars-cov-2 persistence in the gi tract in covid-19 admitted patients. **Gastroenterology, 162(7), pp.S-279**].

2. Lahcene, N.L., Moskowitz, J.E., **Sharma, A.K.**, Martin, A., Merchant, A., Fleshner, P. and Devkota, S., 2022. 1059: Spatial characterization of immune cells and bacterial co-localization in crohn's disease's creeping fat. **Gastroenterology, 162(7), pp.S-241**].

Oral/Poster Presentations

- **Selected speaker, 2022** — 'In-Patient Antibiotic Exposure Promotes SARS-CoV-2 Persistence in the GI Tract in COVID-19 Admitted Patients' at *Digestive Disease Week (DDW) 2022*, at San Diego, CA.
- **Invited speaker, 2020** — 'Emergence of microbiome in therapeutics – Ongoing efforts, challenges, and future opportunities' at *Department of Pharmaceutical Sciences, Dr. H.S. Gour University, Sagar, M.P. India.*
- **Selected speaker, 2019** — 'Mapping gastrointestinal gene expression patterns from fecal RNA-seq' at *UMN Seminar, University of Minnesota Twin Cities, MN, USA.*

- **Selected speaker, 2016/2017** — 'Development of computational methods for large scale data analysis' *in 3rd and 4th Annual Biology meeting at IISER Bhopal, M.P., India.*
- **Invited speaker, 2015** — 'Basics of machine learning for high-throughput multi-omics data analysis' *in National Workshop at Barkatullah University Bhopal, India.*
- **Selected speaker 2015** — 'Computational methods for taxonomic and functional annotation using machine learning based approaches' *in The Human Microbiome conference, at EMBL, Heidelberg, Germany.*

Teaching experience

- **BIOL 1961, Foundations of Biology Lab I for Biological Sciences Majors (BIOL):** — Teaching basics of microbiome to computational microbiology students (16 contact hours/week, from July 2018 - March 2021).
- **BIOL 3004, Foundations of Biology for Biological Sciences Majors, Part II Laboratory:** — Leading various groups of computational microbiology students for bioinformatics analysis of 16S rRNA data from published microbiome studies (16 contact hours/week, from July 2018 - March 2021).

Achievements

- **International Travel Grant, 2019** — Received $1000 grant to present my work at Keystone Symposium on "Microbiome: Therapeutic Implications (T1)" *in October 2019 at Ireland.*
- **PBC Postdoctoral Fellowship, 2018** — Received a Israel government fellowship for three years to pursue postdoctoral research *at Bar-Ilan University, Israel.*
- **DST Travel Award, 2017** — Received travel award from Department of Science and Technology, India to present my doctoral research *in Symposium: NextGen Immunology at Rehovot, Israel.*
- **EMBL Grant, 2015** — Received €1000 grant to present my work *in The Human Microbiome Conference" at EMBL Germany.*

Selected skills

- **Scripting:** Proficient in languages such as R/Bioconductor, and Python
- **Shell scripting:** Unix/Linux
- **NGS data processing:** **6+ years** of experience in the processing of NGS datasets e.g. alignment, assembly, gene prediction, variant calling and comparative genomics
- **Single cell assays:** **recently started** analysis of scRNA-seq and Imaging Mass Cytometry (IMC) datasets
- **Statistical analysis:** Multivariate statistics, linear mixed models, and machine learning/deep learning algorithms for pattern identification from large-scale biological data sets
- **Tools and databases:** Experience in the installation/maintenance, development and implementation of bioinformatics tools, pipelines, and databases at local and High-performance computing environment
- **Cloud platforms:** High-performance computing/AWS ecosystem