

Aurora Britania Diaz Fernandez, MD, MSc

Medical Doctor | Master in Bioinformatics | Physician-Scientist

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PROFESSIONAL SUMMARY

Multidisciplinary physician-scientist with experience in immunology, infectious diseases, microbiome research, and bioinformatics. Contributes to OSDR projects analyzing neuroinflammation, viral reactivation, and host-pathogen interactions in Alzheimer's disease and astronaut omics data. Skilled in glycan bioinformatics, molecular modeling, RNA-seq analysis, microbiome workflows, viral genomics, and rapid pathogen detection technologies. Clinical experience includes a high-difficulty rural medical service placement in an isolated, resource-limited, high-altitude setting, strengthening expertise in operational medicine, remote healthcare, and decision-making under constraints.

CAREER GOAL

To advance research at the intersection of infectious diseases, neuroinflammation, and space health by integrating computational biology with experimental approaches. I aim to develop precision tools for rapid pathogen detection and to uncover how immune-microbial interactions influence brain function in environments ranging from clinical settings to microgravity and isolated operational environments.

RESEARCH INTERESTS

- Immunology & mucosal immunity
- Microbiome & host-pathogen interactions
- Bioinformatics & computational biology
- Aerospace medicine & astronaut health
- Neuroinflammation & neurodegenerative diseases
- Glycobiology & glycan analysis
- Gut-brain axis & immune signaling
- Operational and remote medicine

EDUCATION & CREDENTIALS

Medical Doctor | *Universidad Nacional de San Agustín* | Class of 2023 | Peru

- Graduated with High Distinction: Public Commendation for thesis excellence.
- Thesis: Design of a biomedical soft robotic device for lower-limb mechanical muscle rehabilitation and electrochemical monitoring under reduced-gravity space environments.
- Integrated biomechanics, sensor development, and space physiology to address musculoskeletal health challenges in extreme environments.

Bachelor of Medicine | *Universidad Nacional de San Agustín* | Class of 2023 | Peru

- Head of Research, Immunology Research Group.

Master in Bioinformatics | *Universidad Europea de Madrid* | Graduated: November 2025 | Spain

- Master's thesis: Methodological update and optimization of a bioinformatic pipeline for microbiome analysis in patients with systemic autoimmune diseases.
- GitHub: https://github.com/ab-diaz/MicroSeq16S_Upgrade.git
- Developed and optimized an automated Snakemake-based workflow (MicroSeq16S Upgrade) integrating QIIME2, DADA2, PICRUSt2, and multi-step quality control to enable high-resolution microbiome profiling in systemic autoimmune diseases.
- Added contamination-filtering and functional prediction modules, improving reproducibility and analysis efficiency. Completed while serving in Peru's rural medical service, demonstrating resilience and strong independent problem-solving in low-resource environments.
- Relevant coursework: Genomic and Proteomic Data Analysis; Machine Learning for Healthcare; Python, R, and SQL Programming for Bioinformatics; Molecular Docking and Virtual Screening; Linux and Windows Bioinformatics Software; Computational Biology and Systems Biology.

CAREER EXPERIENCE

RESEARCH EXPERIENCE

Bioinformatician / Research Collaborator | *Open Science Data Repository (OSDR), Brain Analysis Working Group* | December 2024-Present | Remote

- Works with the Brain Analysis Working Group in projects related to neuroinflammation, viral reactivation, Alzheimer's disease, and astronaut omics data.

Development of VIRALL | *NASA OSDR Brain AWG* | 2024-Present | Remote

- Supervisors: Prof. Dr. Windy McNerney (Stanford University) and Assist. Prof. Dr. Nidia Trovao (University of Illinois / NIH).
- Collaboration: Prof. Dr. Christopher Mason and Dr. JangKeun Kim (Cornell University).
- GitHub: <https://github.com/bruPav/Virall>
- Workflow for viral detection and characterization across multiple sequencing platforms.

- Processes raw reads to assemble contigs, identify viral sequences, classify and annotate viruses, assess assembly quality, and quantify abundance.
- Supports Nanopore, PacBio, Illumina paired/single-end, DNA-seq, RNA-seq, hybrid, and scRNA-seq datasets.
- Simple installation and execution on Linux; applied to viral reactivation studies in Alzheimer's disease.

Bioinformatician /Kalamiella piersonii - LPS Adaptations in Spaceflight | 2025-Present | Remote

- Comparative analysis of K. piersonii LPS genes from Earth and International Space Station isolates.
- Pipeline development for LPS gene detection, annotation, and pathway mapping.
- Identified differences in lipid A/LPS modification pathways.
- Use case: LPS adaptations linked to persistence in microgravity and ISS environments.
- Supervisors: Prof. Dr. Kasthuri Venkateswaran (University of North Dakota) and Prof. Dr. Georgios Miliotis (University of Galway).
- Collaboration: Prof. Dr. Windy McEnerney (Stanford University) ,Assist. Prof. Dr. Nidia Trovao (University of Illinois / NIH) and Prof. Dr. Christopher Mason

Visiting Researcher | Institute of Molecular Medicine and Experimental Immunology (IMMEI), University Clinic of Bonn, Tim Rollenske Lab | May & October 2023 | Germany

- Conducted research within the Mucosal Immunology Research Group.
- Gained expertise in glycan bioinformatics: fetched PDB glycan structures, performed 3D alignments, and created multidimensional scaling (MDS) plots for similarity visualization.
- Conducted ELISA assays for protein quantification and immune profiling.

Research Trainee | School of Chemical, Biological, and Materials Engineering, University of Oklahoma, Roger Harrison Lab | March-April 2022 | USA

- Technical training in photothermal cancer therapy, bioconjugation of carbon nanotubes with chemotherapeutic drugs, cell culture techniques, and protein production.
- Conducted experimental work on the bioconjugation of carbon nanotubes with chemotherapeutic agents for targeted breast cancer therapy.
- Gained hands-on experience in cell culture, cultivation of E. coli for gene expression, and maintenance and treatment of breast cancer cell lines.
- Collaborated with interdisciplinary teams to analyze experimental results.

Researcher; Head of Research Division (2021-2022) | Immunology Research Group, Universidad Nacional de San Agustín | 2019-Present | Peru

- Actively contributed to research focused on immunological sciences and host-pathogen interactions.
- Led collaborative research activities and student mentorship as Head of the Research Division.

Research Member | The Space Medicine and Biomechatronic Research Group (SM&BM), The Mars Society Peru Chapter | 2019-2020 | Peru

- Contributed to one of Latin America's first professional research groups focused on human space medicine.
- Published three studies investigating astronaut performance and the effects of microgravity and radiation on physiology.

PUBLICATIONS

- Dev D, **Diaz AB**, et al. Potential Design Criteria and Constraints for Lunar Settlements: Considerations for the Next Decade. IAF Human Spaceflight Symposium. DOI: <https://doi.org/10.52202/083083-0065>
- Rivera MV, Cornejo J, Huallpayunca K, **Diaz AB**, et al. Medicina humana espacial: Performance fisiológico y contramedidas para mejorar la salud del astronauta. Revista de la Facultad de Medicina Humana, 2020. DOI: <https://doi.org/10.25176/rfmh.v20i2.2920>
- Ticllacuri V, Lino GJ, **Diaz AB**, Cornejo J. Design of Wearable Soft Robotic System for Muscle Stimulation Applied in Lower Limbs during Lunar Colonization. Proceedings of the 2020 IEEE INTERCON. DOI: <https://doi.org/10.1109/INTERCON50315.2020.9220206>
- Ticllacuri V, Castrejon N, **Diaz AB**, et al. Design of Biomedical Soft Robotic Device for Lower Limbs Mechanical Rehabilitation under Reduced-Gravity Space Environments. IEEE URUCON, 2021. DOI: <https://doi.org/10.1109/URUCON53396.2021.9647197>

CLINICAL EXPERIENCE

Clinical Internship| Arequipa Clinic | April 2022-March 2023 | Arequipa, Peru

- Rotated through Internal Medicine, Obstetrics, Gynecology, Surgery, and Pediatrics.
- Assisted in laparoscopic, trauma, and cesarean surgeries.
- Gained hands-on experience in general and pediatric emergency care, supporting multidisciplinary teams.

General Physician - Peru Rural and Urban-Marginal Health Service (SERUMS) | Health Center Taquile, Lake Titicaca, MINSA | 2025-2026 | Puno, Peru

- Completed Peru's national Rural and Urban-Marginal Health Service placement for physicians in Taquile, a highly remote, high-altitude island community in Lake Titicaca with limited diagnostic, emergency, and transport resources.
- Government-designated Grade 5 difficulty rural placement, reflecting high geographic isolation and hardship conditions.

- Provided primary and preventive care, delivered community-based interventions, and managed acute and chronic conditions in a resource-limited setting.
- Participated in epidemiological surveillance and health education campaigns.
- Coordinated external referrals and clinical decision-making under conditions of limited medical equipment and delayed transport access.
- Developed operational medicine competencies relevant to remote, isolated, austere environments.

INTELLECTUAL PROPERTY

Patent Application: Development of a Microfluidic Chip for Rapid Pathogen Detection in Healthcare Settings

- Status: Application submitted in collaboration with DLR (German Aerospace Center) under file number 2024/196.
- Date: September 11, 2024.
- Role: Co-inventor - Contributed to concept development, prototyping, and research for multi-pathogen diagnostic technology.

CONFERENCES

Abstract Presentations

- Multifunctional Benefits of Female Contraception in Prolonged Spaceflight. Royal Aeronautical Society, 2020.
- Venous Thrombotic Risk on Females during Prolonged Spaceflight. ISSR&D Conference, 2021.

Attendance and Organization

- XXVIII National Scientific Congress of Medicine Students.
- VI Regional Congress of Clinical Immunology: Cancer Immunology (Organizer).
- ASCO Virtual Education Program, 2020.

ADDITIONAL TRAINING & CERTIFICATIONS

- Basic Life Support (BLS), American Heart Association, December 2023.
- Modern Virology and Immunology: Virotechnology, Vaccines, and Therapies, IPGEN, April 2020.
- Structural Bioinformatics: Protein Modeling and Genome Assembly, IPGEN, April 2020.
- Applied Biostatistics for Research in Health and Basic Sciences, IPGEN, March 2020.
- Basic and Advanced Molecular Biology Techniques: From DNA and RNA Extraction to Molecular Diagnostics, IPGEN, October 2020.
- Introduction: Python for Chemists, Instituto de Investigacion Ambiental y Microbiano, June 2023.
- Introduction to Breast Cancer, Yale University, December 2019.
- Mentorship in Science, Serendipity Program.
- Journal Club UTEC, Tissue Engineering, 2020.
- Coordinator, National Journal Club of Immunology, 2021.
- Introduction to Digital Technologies for Efficient Health Management, Red de Salud Arequipa-Caylloma, 2025.
- Virtual Training in Biosecurity, Red de Salud Arequipa-Caylloma, 2025.

ADDITIONAL WORK

- Nexus Aurora Medical Division - Disseminating space medicine research.
- TELUS International AI - Ad Assessor.

AWARDS & HONORS

- Admitted in Second Place to the Faculty of Medicine, National University of San Agustin; achieved the second-highest score among 10,850 applicants.
- Nexus Aurora: Mars City Design Competition, 1st Prize; multidisciplinary international group work on medical infrastructure, radiation protection, and public project presentation.
- Mars Desert Research Station Selection: selected/admitted for MDRS analog research and health officer role, December 2025
- Finalist - Lunar Base Design Competition, The Moon Society; recognized for Prosperity Lunar Station - Potential Design, Criteria, and Constraints for Lunar Settlement in 10+ Years' Time, ranked among the top 10 projects presented.
- Recognition for Contribution to Photothermal Therapy Research, University of Oklahoma; participated in an international co-investigation project on photothermal therapy with carbon nanotubes for cancer treatment.
- Winner - 1st MarsU Symposium 2021; co-author on the winning team designing a system with potential to advance humanity's efforts to make life multiplanetary.
- Selected Paper - Top 5 Presentation, SpaceCHI 2021, MIT Media Lab; presented Design of Wearable Soft Robotic System for Gait Muscle Stimulation During Lunar Colonization.
- Royal Aeronautical Society Aerospace Medicine Grand Round; selected among the top 3 best abstracts presented.

SCIENTIFIC SOCIETIES

- Co-founder - Peruvian Society of Aerospace Medicine.
- NASA Open Science Data Repository (OSDR), Brain Analysis Working Group, Viral Reactivation subgroup.

- American Society of Clinical Oncology.
- The Mars Society, Peru Chapter.
- Space Generation Advisory Council.
- The Organization for Space Medicine, Engineering and Design (OSMED).
- Immunology Research Group, Universidad Nacional de San Agustín.

SKILLS

- Immunology: ELISA, cell culture, mucosal immunity, neuroinflammation, host-pathogen interactions.
- Bioinformatics: Glycan analysis, MDS plotting, data visualization, viral genomics, microbiome analysis, NGS workflows, functional annotation.
- Diagnostics: Microfluidic technologies, spectroscopic techniques, rapid pathogen detection technologies.
- Software: Python, R, SQL, Snakemake, Linux, QIIME2, DADA2, PICRUSt2, GsAlign.
- Clinical and operational medicine: primary care, preventive care, epidemiological surveillance, remote medicine, emergency management, clinical documentation, patient communication.
- Communication: scientific writing, mentoring, public speaking, international collaboration, health education.

LANGUAGES

- Spanish: Native.
- English: Advanced / Upper-Intermediate (PET, CEFR B2).
- French: Basic (DELF A1).