Aga Khan University- FHS-PhD Programme
List of funded projects for potential PhD Candidates

Biological Sciences Stream						
Sr. No.	Name, Email address and Department of Primary Supervisor	Supervisory Team	Title of Project/ Source of funding	Research Funding available	Funds available until	Key Objectives of research project
1	Dr Kulsoom Ghias kulsoom.ghias@aku.edu Asso. Prof & Chair, Dept of Biological and Biomedical Sciences	Drs Shahid Baig, Rashida Ahmed, Sadaf Khan and Munira Moosajee	Molecular characteristics of colorectal cancer in Pakistani population	The primary supervisor has ~$1500/year available from a research endowment	No end date	CRC can be both sporadic and hereditary, and diet and environment may play a role superimposed on genetic background. It has been hypothesized that early onset colon cancer is a biologically and clinically distinct entity from typical onset disease. Accordingly, the key objectives of the research project are to: • Determine genetic mechanisms underlying early onset CRC. • Identify epigenetic mechanisms and drivers of early onset CRC.
Pre-requisites of PhD candidate applicants (graduate qualification requirement): Molecular Biology, Cancer Biology, Biochemistry, Genetics or equivalent						
2	Dr Zahra Hasan zahra.hasan@aku.edu Professor, Dept of Pathology and Laboratory Medicine	Drs Maria Joao Amorim and Kiran Iqbal	Investigating drivers of immunity against pathogens in the Pakistani population	PKR 110 million and USD 250,000	2025	The key objectives of research project are: • To investigate the humoral and cellular immunity induced by different COVID-19 vaccinations, investigating their impact against SARS-CoV-2 and other respiratory viruses. • To look at immunity in the Pakistan population against new and emerging SARS-CoV-2 variants. • To use genomics and bioinformatics approaches to look at cross-protective immunity in the population.

Pre-requisites of PhD candidate applicants (graduate qualification requirement): Laboratory research experience in immunology, microbiology and/ or genomics is required						
3	Dr Tashfeen Ahmad tashfeen.ahmad@aku.edu Asst. Prof, Dept. of Surgery	Drs Farhan Raza Khan, Afsar Mian and Azhar Hussain	Stem cells from human dental pulp: Developing an in vivo model of tooth-like tissue regeneration	PKR 5,500,000	June 2026	The key objectives of research project are: • To isolate and characterize dental pulp stem cells from primary teeth. • To use a tooth / dentin animal model for subcutaneous implantation of human dental mesenchymal stem cells in Tricalcium Phosphate (TCP) scaffold along with dentin matrix protein-1 (DMP-1) for regeneration of calcified tissue • To assess tooth-like tissue formation by the dental stem cells by determining similarity of regenerated tissue with normal tooth.
Pre-requisites of PhD candidate applicants (graduate qualification requirement): MPhil and Background in Biological Sciences						
4	Dr Waqasuddin Khan waqasuddin.khan@aku.edu Asst. Prof, Dept. Paediatrics & Child Health	Drs Naveed Iqbal, Fyezah Jehan and Imran Nisar	Ability of Vivomixx to Improve Gut Health	USD 2,061,778	December 2024	The key objectives are: • To investigate the composition and dynamics of pregnant women microbiome among pre- and post-intervention samples. • Assess the role of specific microbial taxa and functional pathways in the pathogenesis of EED and their potential as predictive biomarkers. • Examine the association between maternal microbiome profiles and pregnancy outcomes, such as preterm birth, low birth weight, and neonatal complications.
Pre-requisites of PhD candidate applicants (graduate qualification requirement): M. Phil. degree in Biological Sciences (Biochemistry, Molecular Biology, Microbiology). Bioinformatics skills are preferable						
5	Dr Najia Ghanchi najia.ghanchi@aku.edu Asso. Prof, Dept of Pathology and Laboratory Medicine	Dr Asim Beg	Glucose-6-phosphate dehydrogenase activity in individuals with and without malaria	USD 303,801	2026	The key objectives are: • To quantify the change in G6PD activity over time in individuals with and without P. vivax malaria. • To identify prevalent G6PD genotypes in Pakistani Population. • To characterize genomic determinants of the observed change in G6PD activity.

Pre-requisites of PhD candidate applicants (graduate qualification requirement): Experience of working in molecular biology laboratory focusing on next generation sequencing and bioinformatic is desirable						
6	Dr Najia Ghanchi najia.ghanchi@aku.edu Asso. Prof, Dept of Pathology and Laboratory Medicine	Drs Erum Khan, Bilal Usmani, Asmin Beg and Zafar Fatmi	Pathogen Mapping and disease modelling using vector (Ticks) and environmental data	USD 603,025	2025 (extendable)	The key objectives are: • Improve detection of CCHF and other tick-borne virus in vectors, host and environment • Develop capacity for collection of optimum environmental data using digital databases • Identify risk factors for CCHF and develop risk map to predict CCHF outbreaks
Pre-requisites of PhD candidate applicants (graduate qualification requirement): Basic skills in molecular techniques and field epidemiology						
7	Dr Asim Beg masim.beg@aku.edu Professor, Dept of Pathology and Laboratory Medicine	Drs Erum Khan, Bilal Usmani, Najia Ghanchi, Zafar Fatmi and Rumina Hasan	Pathogen mapping and disease modelling using vector (mosquito) and environmental data	USD 603,025	2025 (extendable)	The key objectives are: • Improve and implement molecular surveillance methods for detection of arboviruses using vector and wastewater samples • Develop mathematical models for predicting arbovirus outbreaks based on vector and environmental data sets
Pre-requisites of PhD candidate applicants (graduate qualification requirement): Basic skills in molecular techniques						
8	Dr Syed Ather Enam ather.enam@aku.edu Professor, Dep. Of Surgery	Drs Muhammad Nouman Mughal and Azhar Hussain	Investigating the molecular signature of glioblastoma to understand diagnostic, prognostic biomarkers, and potential therapeutic targets using expression databases	PKR 90 million	2025	The key objectives are: • Identify mRNA, miRNA, and methylation signatures: Utilize databases to analyze expression profiles in GBM samples, categorizing them based on molecular signature • Validation: Validate the identified signatures in tissue samples obtained from GBM patients, assessing their significance as potential biomarkers in our population • Correlate Molecular Signatures with Clinical Parameters: Investigate the association between signature profiles and clinical parameters such as tumor grade, patient age, and overall survival, to elucidate their clinical relevance (KPS score) • Functional Analysis and Pathway Identification: Perform functional analysis to elucidate the biological pathways and processes influenced by the identified signature, shedding light on the underlying mechanisms driving gliomagenesis and progression
Pre-requisites of PhD candidate applicants (graduate qualification requirement): MPhil and Background in Biological Sciences						

9	Dr Syed Ather Enam ather.enam@aku.edu Professor, Dep. Of Surgery	Drs Muhammad Nouman Mughal and Azhar Hussain	Exploring the role of autophagy-modulating micrornas in glioma progression and therapy resistance	PKR 90 million	2025	The key objectives are: • To elucidate the expression profiles of autophagy markers, signaling genes, and autophagy-associated miRs in low and high-grade patient-derived glioma primary cell lines • To assess autophagic flux in glioma cell lines by evaluating LC3-I, LC3-II, and p62 protein levels • To quantify autophagy levels by measuring GFP-LC3-II-labeled autophagosomes in primary cell lines • To characterize the mutational landscape of IDH1/2, ATRX, GFAP, Ki-67, p53, MDM2, CDK4, PTEN, c-MYC, EGFR, PDGFR, MGMT promoter, and TERT in glioma cell lines to categorize them based on glioma associated driver mutations • To analyze the expression patterns of autophagy-associated genes and miRs in each glioma cell line • To investigate the impact of potential autophagy-associated miRs in glioma cell lines using siRNA technology to downregulate an oncomir or by upregulating a miR using overexpression plasmid
Pre-requisites of PhD candidate applicants (graduate qualification requirement): MPhil and Background in Biological Sciences						
10	Dr Hammad Hassan hammad.hassan@aku.edu Asst. Professor, Dep Centre for Regenerative Medicine and Stem Cell Research	Drs Sheerien Rajput, Natasha Ali and Irfan Khan	A novel approach of generating laboratory-grown red blood cells (RBCs) using synthetic mRNA based reprogrammed induced pluripotent stem cells (iPSCs)	PKR 20 million	2026	The key objectives are: • To utilize unmodified synthetic reprogramming mRNA method (OCT4, SOX2, KLF4, cMYC, NANOG, and LIN28 [OSKMNL]) with immune evasion mRNAs (E3, K3, and B18R [EKB]) from vaccinia virus, to generate stable iPSC lines. • Comparative Analysis with Existing RBC Production Methods: Compare the functionality and cost-effectiveness of the generated RBCs with those produced by other current methods, such as those derived from adult stem cells or donor blood and recently from immortalized progenitor cell lines, to highlight the advantages or identify areas for improvement. • Detailed characterization of the generated iPSC lines. • Genomic Stability Assessment: Examine the genomic stability of iPSC lines over extended culture periods, particularly looking for potential mutations or epigenetic changes that could occur due to the reprogramming and differentiation processes. • Differentiation of iPSCs towards erythroid lineage to produce mature RBCs.

						• Optimization of RBC Maturation and Lifespan: Develop and test strategies for optimizing the maturation process and lifespan of the lab-grown RBCs, which is critical for their eventual practical use in transfusions. • Metabolic Profiling: Conduct metabolic profiling of the generated RBCs to ensure that their metabolic activities are consistent with those of native RBCs, which could be critical for their functionality in oxygen transport and overall cell health. • Immune Response Evaluation: Assess the immunogenicity of the generated RBCs in vitro and in vivo (if animal models are used), focusing on the efficacy of the immune evasion strategies employed during iPSC line development. • Investigation of Scalability and Reproducibility: Evaluate the scalability of the synthetic mRNA-based iPSC reprogramming and RBC differentiation process, assessing the consistency of iPSC and RBC characteristics across multiple batches and scales. • Application in Disease Models: Utilize the generated RBCs to model diseases such as sickle cell anemia or thalassemia in vitro, to test the effectiveness of potential treatments or to understand disease mechanisms better.
Pre-requisites of PhD candidate applicants (graduate qualification requirement): benchwork with significant expertise in Stem cell biology, Immunology and Molecular Biology, cellular and molecular Biology, including hands-on experience in Tissue Culture, Individuals with hands on iPSC culture will be preferred, proficiency in various laboratory methodologies, notably fluorescent and confocal microscopy qPCR, western blotting, as well as flow cytometry and advanced Molecular Biology, such as gene cloning, qPCR and CRISPR-Cas9 applications						