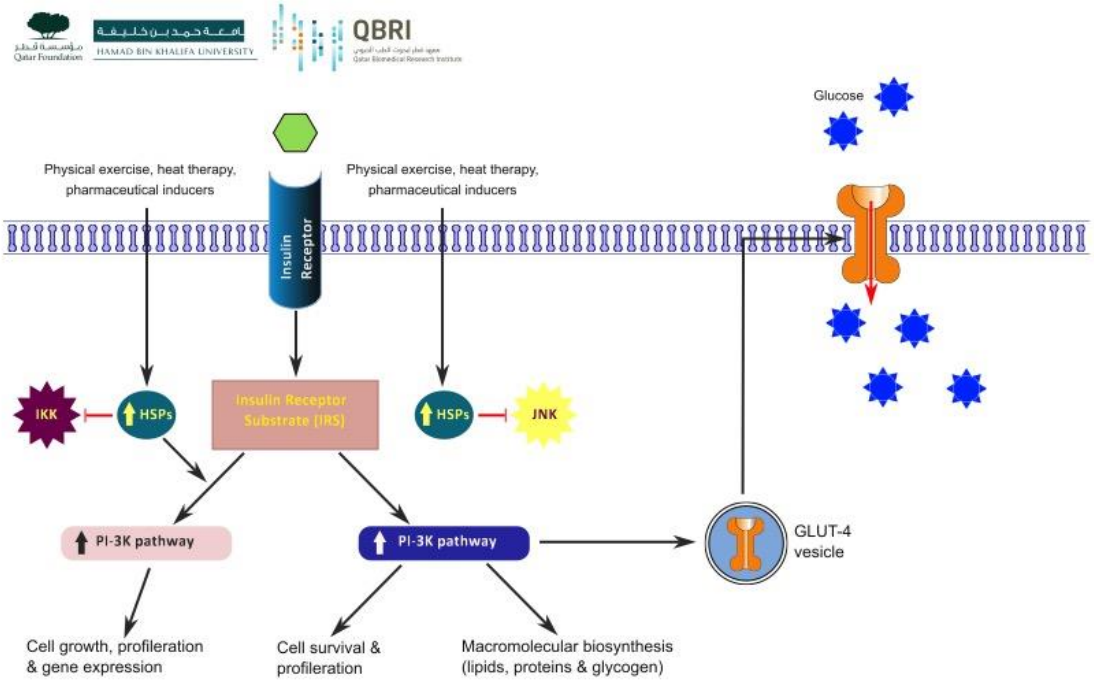
Summer Research Program – Projects

Project #1

Title: Role of DNAJB3 Chaperone in Glucose Homeostasis

Description: The overall focus of this research project is to understand the role of DNAJB3, a component of the heat shock response in the pathophysiology of obesity and diabetes. We recently described that obese and diabetic humans displayed impaired expression of DNAJB3 with a concomitant increase in various forms of metabolic stress that are known to contribute to diabetes through the development of insulin resistance). We are currently pursing our research activity to elucidate the direct role of DNAJB3 in glucose homeostasis and insulin signaling both in vitro and in vivo. More specifically, we will investigate the effect of DNAJB3 on glucose uptake, insulin signaling, cell apoptosis, inflammatory response, and metabolic stress.

Mentor/s: Dr. Mohammed Dehbi, Principal Investigator. Email: mdehbi@qf.org.qa
Dr. Abdelilah Arredouani, Scientist . Email: aarredouani@qf.org.qa



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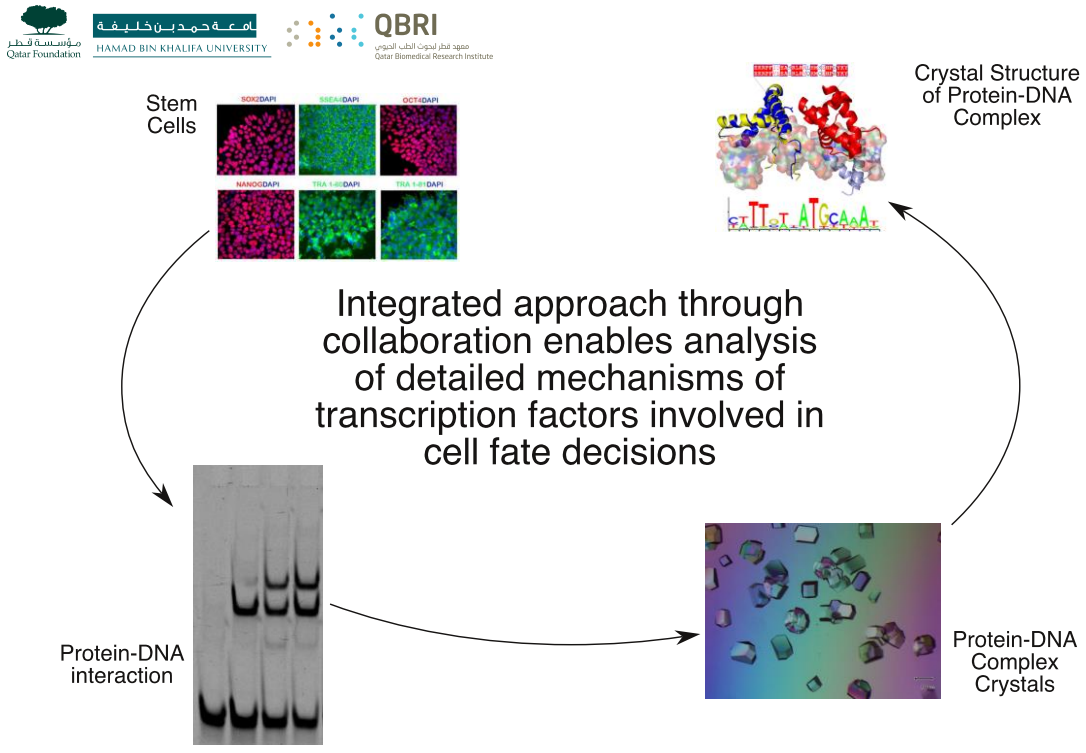
Project #2

Title: Characterization and Analysis of Transcription Factors Involved in Stem Cell Biology

Description: Project will encompass studies of various transcription factors (TF) such as Oct4 and homologues as well as Sox2 and homologues. Studies will include moderate scale expression and purification of the TFs as well as subsequent characterization using a variety of techniques including mobility shift assays (EMSA), crystallization attempts and potentially ITC and/or Biacore. All the studies will be aimed at understanding how the wild type and any mutants interact with their cognate DNA and thereby carry out transcription.

Mentor/s: Dr. Prasanna Kolatkar, Senior Scientist. Email: pkolatkar@qf.org.qa
Dr.Fatma Abdallah, Scientist. Email: fabdallah@qf.org.qa
Dr. Bala Moovarkumudalvan, Post Doc,
Email: bmoovarkumudalvan@qf.org.qa



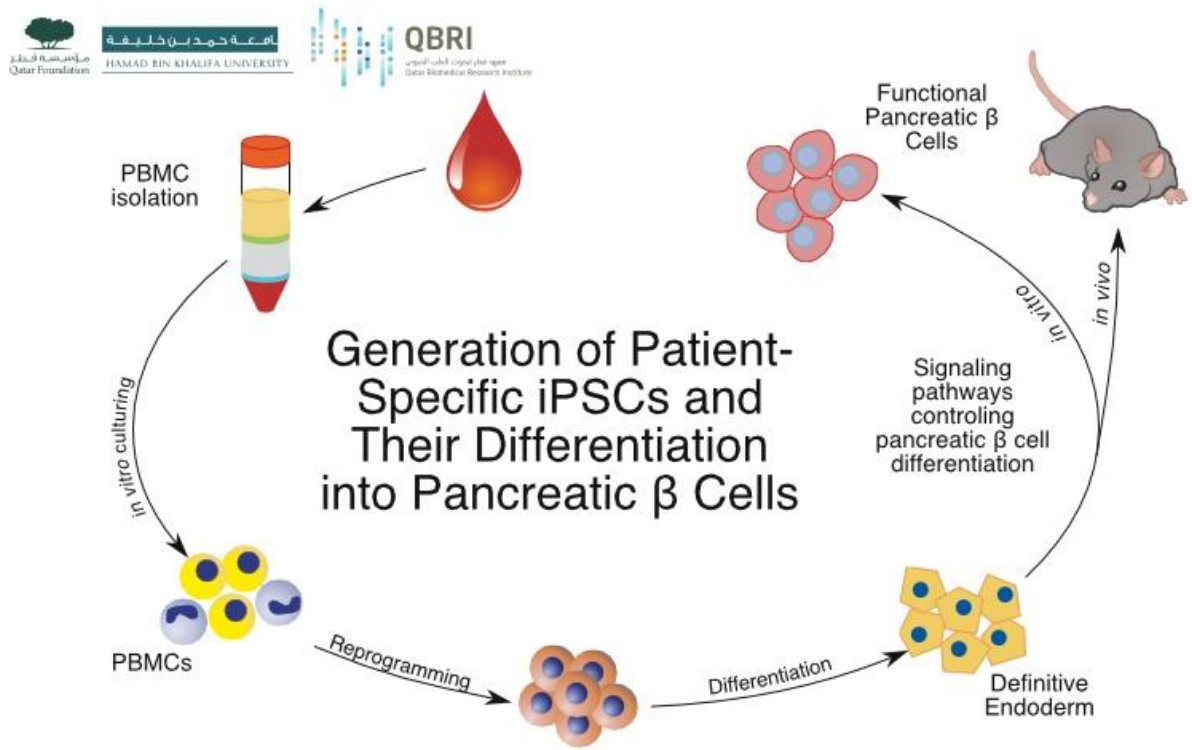
Project #3

Title: Differentiation of Pluripotent Stem Cells into Pancreatic Progenitors

Description: This project is designed to provide participants with a solid understanding of the basic biology of pluripotent stem cells (hESCs and hiPSCs) with a specific focus on pancreatic lineage differentiation. It will equip participants with hands-on experience in the following areas:

- Culture, expansion, and maintain hESCs/hiPSCs using feeder-free system
- Differentiation of hESCs/hiPSCs into definitive endoderm (SOX17-positive cells)
- Differentiation of hESCs/hiPSCs into pancreatic progenitors (PDX1-positive cells)
- Examine the pluripotency and differentiation markers in undifferentiated and differentiated hESCs/hiPSCs using different techniques

Mentor: Dr. Essam Abdelalim, Scientist Email: emohamed@qf.org.qa



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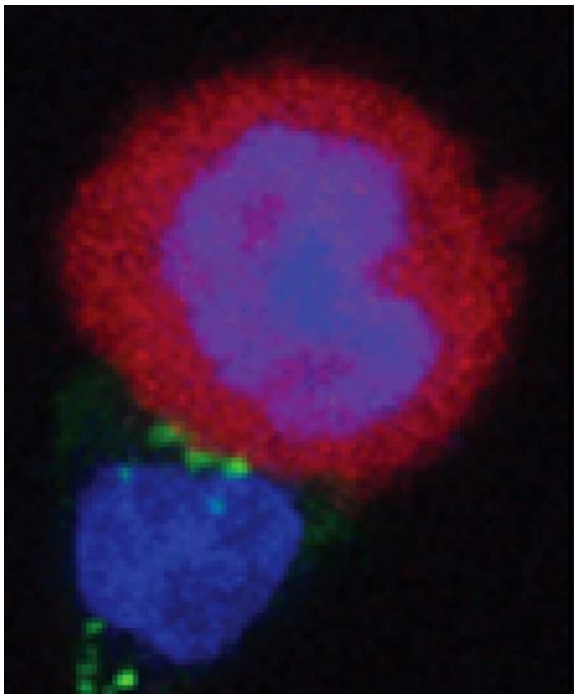
Project #4

Title: Mechanisms of Breast Cancer Escape from Natural Killer (NK)-Mediated Anti-tumor Immunity

Description: Natural Killer (NK) cells are lymphocytes of the innate immune system that play an important role in preventing and controlling tumor growth and metastasis. NK cells induce the elimination of tumor cells either by directly killing cancer cells or by secreting cytokines, which participate in cancer elimination by several mechanisms including activation of the adaptive immune system. During tumor development and progression, cancer cells develop mechanisms to escape NK surveillance. However, these mechanisms are still unclear.
Our aim is to study NK cell immune surveillance and immune escape in breast cancer which is the most common cancer and second leading cause of death among women in Qatar and worldwide. Understanding these mechanisms may lead to the development of new NK-based approaches to prevent and/or treat breast cancer.

Mentor: Dr. Manale Karam, Post Doc. Email: mdoldur@qf.org.qa



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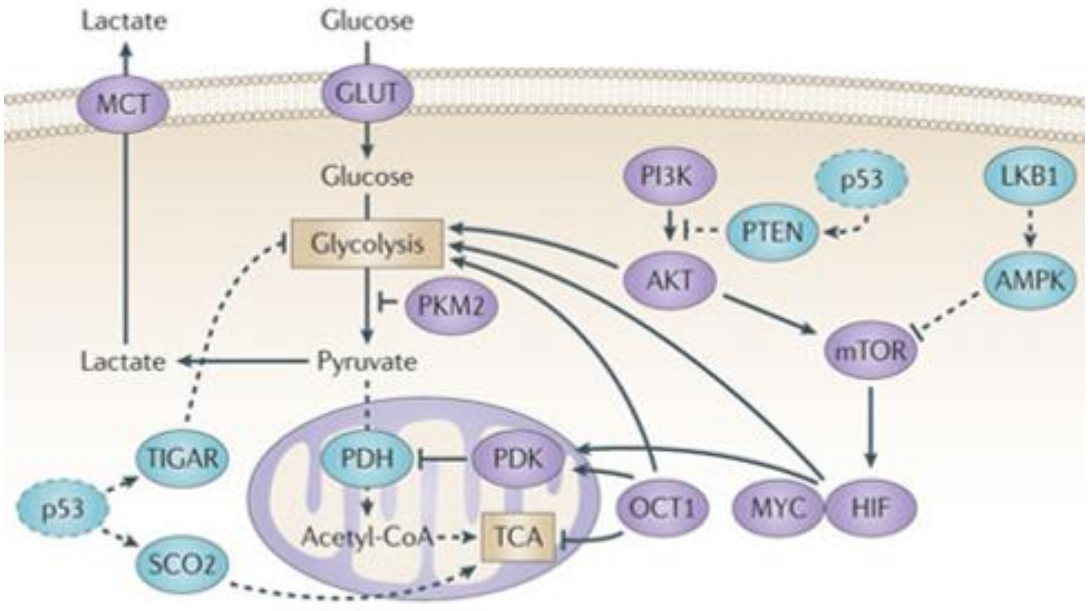
Project #5

Title: Study of the Role of Lactate Dehydrogenase C (LDHC) in Cancer Metabolism of Triple Negative Breast Cancer

Description: Triple negative breast cancer (TNBC) represents 15-20% of breast cancer cases and is associated with advanced disease at diagnosis and poorer outcome. The molecular mechanisms underlying the aggressive behavior and poor clinical phenotype of TNBC are not yet fully understood. Preliminary results in our laboratory identified LDHC to be highly expressed in TNBC cell lines. LDHC is a glycolytic enzyme, suggesting that it could provide an alternative metabolic pathway for rapidly growing tumors with increasing nutrient demands. In this project, we will investigate the involvement of LDHC in the metabolism, growth and survival of TNBC cells.

Mentor/s: Dr. Julie Decock, Scientist. Email**:** jdecock@qf.org.qa
Dr. Mariam Al-Muftah, Scientist. Email: maalmuftah@qf.org.qa



Cancer cell metabolism driven by multiple oncogenic signalling pathways.
Cairns RA *et al*, Nat Rev Cancer (2011), 11:85-95.
doi:10.1038/nrc2981

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Project #6

Title: Identification and Functional Analysis of Novel MicroRNAs Involved in Triple Negative Breast Cancer

Description: Triple negative breast cancer (TNBC) is associated with advanced disease at diagnosis and poorer clinical outcome. Due to the lack of established markers significantly associated with its prognosis, patients do not benefit from endocrine or HER2-targeted therapies and represent 15-20% of cases mandating the need for novel treatments. To date, the molecular mechanisms for the biological and clinical aggressiveness of TNBC are not fully understood. This project is set to investigate the role microRNAs play in the pathogenesis of TNBC with the aim of identifying molecular drivers (microRNAs and their target pathways) that can be therapeutically targeted.

Mentor/s: Dr. Mariam Al-Muftah, Scientist. Email**:** maalmuftah@qf.org.qa
Dr. Julie Decock, Scientist. Email: jdecock@qf.org.qa