Modulation of PPARγ-dependent and Independent Pathways: Potential for Improving Clinical Outcomes for Diabetes Mellitus

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Diabetes mellitus (DM) carries an immense clinical and economical burden worldwide. The molecular mechanisms implicated are complex. Both T1DM and T2DM involve beta cell inflammation and apoptosis. In T1DM, success of long-term insulin-free interventions such as pancreatic islet transplants is often hindered by donor availability, autoimmune reactions and hypoxia. Drug design allows for the development of more specific and direct targetting of therapies including ligand-receptor interactions, evident in the thiozolidinediones (TZDs) mechanism of action. TZDs, e.g. Rosiglitazone, have been used primarily for the PPARγ-dependent pathway activation modifying metabolism, inflammation and immune reposnses occuring in adipose tissue, liver and pancreas at both a celluar and organ level. Pharmaceutical chemistry facilitates the TZD-PPARγ interaction as the acidic hydrogen on the polar TZD ring forms a hydrogen bond with the phenol group of Tyr473 on helix 12. For rosiglitazone, the formation of hydrogen bonds between Tyr-473 and His-449 residues has been shown to inhibit cellular inflammation implicated in the pathogenesis of T1DM. Utilising the mouse beta cell line Min6 and Rosiglitazone we investigated multiple cellular mechanisms: (1) H/PI staining and MTT assays to determine cell viability (2) transmission electron microscopy to decipher changes in cell ultra-structure (3) confocal microscopy and (4) real-time PCR to elucidate intracellular localisation and determined changes in gene expression of key regulatory proteins respectively. We have also shown that pre-treatment with Rosiglitazone increased: (1) cell viability, (2) longevity and (3) stimulated multiple (3i) anti-inflammatory and (3ii) apoptotic signalling pathways. Under hypoxic conditions, we observed time dependant increases in (4) angiogenic and (5) neogenic mRNA expression levels. We suggest that pre-treatment with agents such as Rosiglitazone can increase cell viability, longevity and can potentially reduce the initial number of beta cells required for transplantation through various PPARγ-dependent and PPARγ-independant mechanisms.

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Biography

Dr Tomader Ali



Dr Tomader Ali has completed her undergraduate, Masters of Research and PhD in the United Kingdom followed by postdoctoral studies in the United States of America where she was then employed as the Head of Undergraduate Research. Currently she is an Assistant Professor/Sr Lecturer, Pharmacy Department, at Fatima College of Health Sciences (FCHS) in Abu Dhabi, UAE. As a scientist and educator over the past 13 years, past experiences have armed Dr Tomader with competencies in the primary and secondary areas of expertise, diabetes and cardiovascular & oncology respectively. This is in the wide range of cell biology to therapeutics and public health contexts, with an emphasis on the pathophysiology and mechanisms of human disease. Dr Tomader aims to share her knowledge and help lessen unnecessary global suffering in the context of chronic diseases.

Dr Heba Mohamed

Dr. Heba Mohamed has completed her MSc and PhD degrees in pharmaceutical sciences from faculty of Pharmacy, Cairo University-Egypt. She has extensive experience in different pharmaceuticals analysis. Her work mainly focus on potency, purity, stability testing, bioequivalence and kinetic studies of drugs and metabolites in pharmaceutical formulations and in biological fluids. Lately she focuses the horizon on implementing green analytical chemistry principles in analytical and bioanalytical techniques. She has published more than 20 papers in highly reputed international journals, actively participated in many international conferences and has been serving as reviewer for many highly esteemed journals.

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