Regulation of Endothelial Cell-Specific Molecule 1 (Esm-1)- Implications in Diabetes and Cancer

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At first glance, diabetic kidney disease and cancer may seem to have little in common besides sharing high mortality rates. Diabetic kidney disease is a condition in which increased glucose levels in the blood downregulates vasodilators in the kidney, thus reducing glomerular filtration rate and allowing leukocyte-induced kidney injury. Cancer is an accumulation of genetic errors that results in uncontrollable cell division. Both leukocyte-induced kidney injury and tumoral immune response are guided by molecular barriers that allow leukocyte-induced damage to glomerular tissue and leukocyte evasion of tumoral sites. The glycan region of Endothelial Cell-Specific Molecule 1 (Esm-1), a glomerular-enriched glycoprotein, binds to LFA-1 to form a molecular barrier blocking leukocyte infiltration in diabetic kidney disease and cancer. To investigate the regulatory mechanisms of Esm-1, luminescence assays were utilized for quantification of gene expression while bioinformatic analysis was used for in silico molecular modeling. The 3'UTR of Esm-1 was verified to stabilize Esm-1 expression and reduce translation by more than half (52.4%) when transfected in relation to the empty vector alone. The G1259?A SNP in the 3' UTR of Esm-1 reduced Esm-1 translation by nearly half (47.9%). Bioinformatic analysis was conducted to identify the hsa-miR-181 family as a downregulator of Esm-1 translation. A miRNA-based therapeutic was engineered as a regulatory mechanism for Esm-1 expression in both diabetic kidney disease and cancer. Subsequent qPCR experiments quantified hsa-miR-181 expression in vitro. Further inquiry into the regulation of Esm-1 will elucidate the development of novel diabetic kidney disease and cancer therapeutics.

Awards Won:
Third Award of $1,000