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How does high glucose affect to genome-wide mRNA expression profiles in fully differentiated human epithelial cell culture model

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Glucose is one of the nutritional factors that involves in developing of obesity and type 2 diabetes in human. The studies indicated that enterocyte cells on intestine might play a role in dietary glucose sensing during obesity. Obese people are consumed high amount of dietary glucose and enterocyte cells consequently are exposed to high glucose. Thus, we aimed to find relevant physiological pathways and genome-wide mRNA expression profiles that can be regulated by glucose in fully differentiated human intestinal epithelial (CaCo-2). The cells were maintained two different glucose levels (5.5 mM for control, 25 mM for high glucose) at least three passages. The cells were grown on transwell system for 21 days to mimic human intestine system. Transepithelial electrical resistances (TEER) were measured to control monolayer formation and polarization. RNA isolation was performed and whole genome mRNA expression profile was determined following gene ontology analysis to find affected molecular pathways. Compared to control relative glucose level was found high in basolateral site of CaCo-2 cells that were under high glucose condition without effecting TEER. GLUT2, SGLT1, GLUT5 mRNA levels were significantly reduced during elevated glucose levels which is consistent with literature. Significant fold change analysis showed that 351 genes up-regulated and 468 genes under high glucose condition. We found high glucose significantly leads changes of molecular pathways (down-regulated; insulin signaling, focal adhesion, inositol phosphate, fructose/mannose, glycolysis and up-regulated; ubiquitin-mediated proteolysis, spliceosome, protein export). These results provide us better understanding and open new window for glucose metabolism of enterocytes during obesity.

Biography

Sukru Gulec has received his Bachelor's degree in Biology from Ankara University, Turkey. He has attended the Master of Science in Biotechnology, Ankara University College of Medicine and graduated in 2006. He has worked at Food Science and Human Nutrition (FSHN) Department, University of Florida as a Biological Scientist. He was accepted as a PhD student and joined in nutritional science interdisciplinary program at FSHN Department, University of Florida in 2009. He has received his PhD from the University of Florida in 2013 and stayed in same department as Postdoctoral Associate. He was hired as an Assistant Professor in Izmir Technical Institute in 2014.

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