Genes Negatively Regulated by FOXO1 and Their Association With Breast Cancer

Soti, Bipul (School: Science Academy of South Texas)

This experiment aims to see the connection between genes downregulated by the Forkhead Box O1 protein (FOXO1) in skeletal myocytes and breast cancer. FOXO1 is observed to be significantly upregulated in low-energy conditions like diabetes and obesity, but it is also known to interact with other cellular processes to cause myopathy, cell cycle arrest, and apoptosis. In rats, it has been found to decrease both weight and Type I (slow twitch) to Type II (fast twitch) muscle differentiation. It may also be linked to age-related muscle degeneration in humans. This study used Gene Set Enrichment Analysis to find which genes regulated by FOXO1 in skeletal muscle are regulated by FOXO1 in breast cancer. It then analyzed the association of those genes with breast cancer prognosis, the differences in their transcription between cancerous and non-cancerous cells, and their co-expression with each other. This was done using Kaplan-Meier Survival Analysis, Expression Analysis, and Spearman Analysis respectively through GEPIA2. Of the 143 genes downregulated by FOXO1 in breast cancer, 10 are significantly associated with breast cancer prognosis. Of those 10 genes, 3 have significant differences in transcription between cancerous and non-cancerous cells. Those three genes were also found to be significantly coexpressed with each other. These three genes, WNT7B, SFRP1, and EZR, all have different functions. While WNT7B promotes growth and EZR promotes migration, SFRP1 promotes growth regulation but it is still negatively regulated by FOXO1. This indicates that more work ought to be done on FOXO1's regulatory mechanisms in cancer, taking into consideration that it may not just be promoting apoptosis and cell cycle arrest but that it may be promoting growth factor independence entirely.

Awards Won: