Urine Protein Biomarkers of Bladder Cancer arising from Aptamer-based Screening of 1300 proteins

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Purpose

The purpose of this study is to identify novel urine protein biomarkers of bladder cancer.

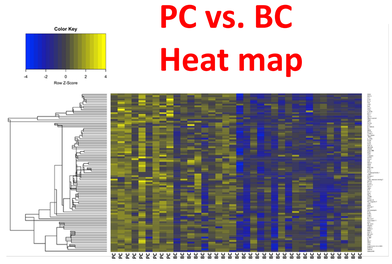
Background

Bladder cancer is one of the principal concerns of the healthcare field for a variety of reasons. It is currently the sixth most common cancer and the eighth-most common cause of cancer death among men and has proven to be a recurring challenge to find a non-invasive form of detection and monitoring. In recent years, aptamer-based screening and ELISA validation have been able to analyze protein arrays in relatively large scales with exceptional accuracy. Using these methods, one can assess even low abundance proteins and measure their concentrations within different solutions.

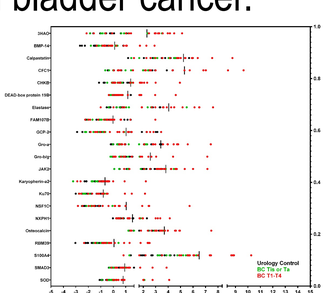
Results

The aptamer-based screening revealed 330 proteins to show great significance in Bladder Cancer versus Urology Controls, 73 proteins in Tis-Ta versus T1-T4, and 113 proteins in Prostate Cancer versus Bladder Cancer. Further analysis and research were then conducted, including creating volcano plots, heatmaps, correlation plots, and dot plots. From the data collected, 26 proteins were then selected to undergo target ELISA validation using the same urine samples from the initial cohort. Proteins that are successfully validated will then be selected for secondary ELISA validation using an independent patient cohort. This will allow experimenters to identify which proteins prove to be novel urinary biomarkers of bladder cancer.

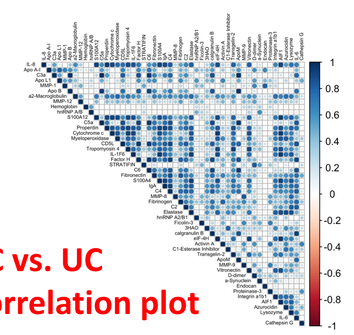
PC vs. BC
Heat map



Ti-Ta vs. T1-T4
Dot plot

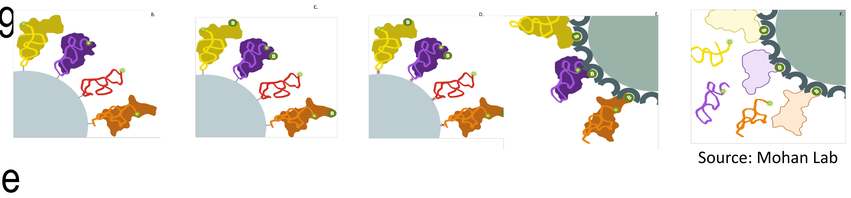


BC vs. UC
Correlation plot

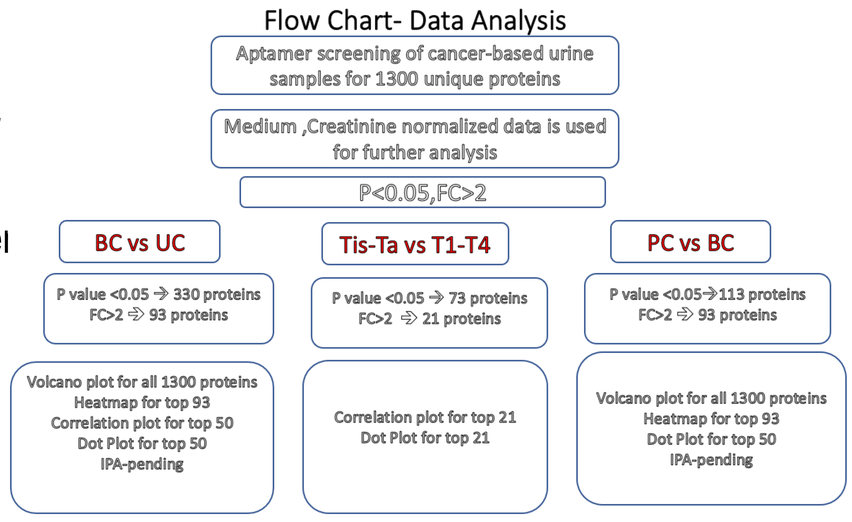


Methodology

Urine samples from 51 subjects (UC=15, PC=9 Tis=4, Ta=5, T1=10, T2=3, T3=3, and T4=2) were used for the screening of 1300 unique human proteins relevant to bladder cancer. The aptamer-based screening was then applied to create volcano plots, heatmaps, correlation plots, and dot plots indicating various levels of significance amongst the top-most proteins. Levels of significance between Bladder Cancer versus Urology Controls, Tis-Ta versus T1-T4, and Prostate Cancer versus Bladder Cancer were then determined. Additionally, each respective protein was used to calculate fold change (FC), Mann Whitney tests, and t-tests. A subset of elevated proteins was then analyzed, and 26 were chosen for target ELISA validation.



Source: Mohan Lab



Conclusions

The purpose of this study was to identify novel urine protein biomarkers of bladder cancer. Through data collection and analysis of the aptamer-based screening, experimenters were able to select 26 proteins for target ELISA validation. The next steps will include conducting the target ELISA validation using the initial patient cohort, analysis to see which proteins were successfully validated by ELISA, and conducting a secondary ELISA validation using an independent patient cohort.

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