【Outstanding Academic Research Meeting 1-2】

Investigation of Energy Metabolism Pathways and Biomarkers Verification in Renal Cancer Through Integrated Proteomics and Metabolomics

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30% of renal cancer patients are diagnosed at the metastatic stage with a poor prognosis result. A systematic analysis of the molecular pathways dysregulated in kidney cancer will be helpful to gain a better understanding and benefit for the development of novel methods for disease management and potential targeted therapies. To discover potential biomarker candidates, four pairs of renal cell carcinoma (RCC) tissue and their adjacent-normal tissue specimens were labeled by iTRAQ for the LC-MS based proteomic experiment. Dysregulated proteins analyzed by MetaCore revealed the up-regulation of glycolysis pathway and down regulation of multiple proteins involved in gluconeogenesis and oxidative phosphorylation pathways. Furthermore, 34 paired RCC tissues and adjacent normal tissues were profiled for metabolomic changes. After statistical operation and p-value screening of paired T-test, 225 metabolite features show significant changes in RCC tissue. After integration the proteomic and metabolomic results, several energy metabolism pathways were highlighed significantly. For biomarker verification, mass spectrometry-based targeted proteomics were used to verify proteins with dysregulation or involved in the energy metabolism pathways using RCC tissue and urine specimens. We built multiple-reaction monitoring mass spectrometry methods for targeted measurement of proteins involved in oxidation phosphorylation pathway, or additional dysregulated proteins in urine and tissue specimens of RCC patients. In RCC tissue, 25 proteins were downregulated while 13 proteins were upregulated. Additionally, eight metabolites showed significant concentration changes in RCC tissues. Six urinary proteins were found at higher concentrations in RCC urine samples compared to the control group. These urinary proteins and metabolites could serve as potential non-invasive diagnostic markers for the screening and diagnosis of RCC in the future.