High Throughput Isolation of Renal Collecting Ducts

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High blood pressure is a significant risk factor for cardiovascular disease, stroke, heart failure and chronic renal disease. The kidney regulates blood pressure by controlling plasma volume, which is regulated by the rate of sodium intake and excretion. Abnormal sodium retention by the kidneys causes increased plasma volume and cardiac output, which leads to increased blood pressure. The mechanisms involved in abnormal sodium retention by the kidney are not completely understood, but it is known that the collecting duct plays a critical role. The collecting duct consists of three segments: the cortical collecting duct (CCD), outer medullary collecting duct (OMCD), and inner medullary connecting segment (IMCD) that connect to the tubule via the connecting segment (CNT). Recent studies suggest that the CCD/CNT play a more significant role in sodium regulation than the OMCD and IMCD. In vivo structural and functional changes to the collecting duct in response to sodium load and pathological events are not retained in collecting duct culture models thus we are limited to studying the isolated collecting duct. Studies of the isolated collecting duct present a tremendous experimental challenge requiring manual microdissection which is time-consuming, labor intensive, and requires a high level of skill for the identification of tubular segments. A recently developed technique allows high throughput isolation of collecting duct from the various regions of the kidney using Complex Object Parametric Analyzer Sorter (COPAS) (Miller et. al, 2006). Using COPAS, 10 to 14 cm of collecting duct can be obtained for genomic and proteomic analysis in less than 1 hour. The present study demonstrates that molecular changes in the collecting duct as a result of changes in dietary sodium can be studied using the COPAS methodology.