Nefrostat, Portable Diagnostics of Chronic Kidney Disease

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Chronic kidney disease causes progressive loss of renal function, often without visible or specific symptoms in early stages. In the end stage, dialysis or renal transplantation is unavoidable. This disease affects as much as 10% of the population and it was a cause of 735 000 deaths worldwide in 2010. Regular diagnostics is an important part of prevention of this disease. Personal diagnostics without the need for visiting a physician simplifies the measurement of renal function and therefore allows more frequent diagnostics. Glomerular filtration rate depends on renal function, which is usually determined from the concentration of serum creatinine, a waste product of muscles. In this project I successfully constructed a device for electrochemical analysis of concentration of creatinine in blood samples using commercial test strips. Measured data are subsequently processed and sent to the patient’s smartphone. They were found to be comparable to those obtained using a reference creatinine meter. The Nefrostat device is also capable of measuring glucose concentrations in blood and the results are comparable to those obtained from a reference glucometer. Despite its small size, the potentiostat is capable of measuring very low currents in the range of hundreds of picoamperes, is able to measure using several voltammetric techniques and can be reprogrammed while the device is running within seconds.

Awards Won:

Third Award of $1,000