Development of a point-of-care microfluidic assay for messenger RNA expression in leukocyte-derived extracellular vesicles: potential use for stroke diagnosis

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Expediting stroke diagnosis and treatment is a national priority. The most widely available treatment, intravenous recombinant tissue plasminogen activator, is reaching only around 5% of patients with acute ischemic stroke. In my laboratory we are investigating whether point-of-care blood testing could expedite stroke diagnosis and treatment. In prior work we demonstrated the feasibility of this approach by identifying clusters of upregulated messenger RNAs in circulating leukocytes, as well as in leukocyte-derived extracellular vesicles. In collaboration with Dr. Steven Soper at the University of Kansas-Lawrence, we are working to extend these results in a 4-year study. Physicians at SUNY Downstate Health Sciences University will undertake a two-stage diagnostic validation study to further characterize the optimal messenger RNA markers in leukocyte-derived extracellular vesicles circulating in plasma. Meanwhile, the investigators at the University of Kansas will develop the microfluidic mixed-scale fluidic cartridge for the point-of-care technology. At the end of the four proposal the messenger RNA markers characterized at SUNY Downstate are to be integrated into the mixed scale fluidic cartridge, to permit rapid detection and quantitation of mRNA expression. A proof-of-principle pilot study will then be undertaken to evaluate the initial feasibility and accuracy of this assay.