CANCER PREVENTION & RESEARCH INSTITUTE OF TEXAS

Award ID:
RP130597

Project Title:
Single organelle analysis for metabolites in tumor cells using microfluidic devices coupled to direct Nanoextraction-Nanospray

Award Mechanism:
High Impact/High Risk

Principal Investigator:
Verbeck, Guido F

Entity:
University of North Texas

Lay Summary:

Micromanipulation is an important and useful tool that is used to manipulate small particles and cellular materials. Currently micromanipulation is being used in the biological sciences to transfer single cells, isolating them for future studies and analysis, and is also being used to isolate specific bacterial cells from a culture and retrieve them for further study. Our development of nanomanipulation has higher spatial resolution than micromanipulation, so new advances in the biological sciences can be made, specifically to sub cellular analysis and isolation within a single healthy and tumor cell. Recent advances in Mass Spectrometry sensitivity and nano-scale manipulation have led to the development of our direct organelle analysis mass spectrometry and the ability to perform metabolite analysis on individual organelles. Sampling individual organelles will reveal a previously unknown, but marked heterogeneity in organelle-to-organelle metabolite distribution. This type of information is likely to be important to organelle and cellular function and should be expanded to examine metabolite compositions of other subcellular compartments. This method can take advantage of the use on multiple microscopy platforms to take advantage of their strengths to localize areas where chemistry will be of importance. Our platform can be combined with microfractionation, microfluidics and microextraction procedures to map the subcellular chemistry from a single cell. This technology will be able to identify specific chemistry on a single cell level. The final advance in this technology will be to automate the analysis for rapid screening and therapy options. Once single organelle chemistry is determined, and the differences in metabolites are discovered, the results will aid in treatment options and therapy directions for the individual and specific stage of cancer.