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Imaging the Topography and Monitoring the Electrochemical Activity of Biological Samples

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IMAGING THE TOPOGRAPHY AND MONITORING THE ELECTROCHEMICAL ACTIVITY OF BIOLOGICAL SAMPLES

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Scanning Electrochemical Microscopy (SECM) is a useful tool for the analysis of biological samples because the ultramicroelectrode tip of the probe can detect the presence of electrochemically active compounds such as neurotransmitters, particularly dopamine and norepinephrine, while simultaneously characterizing the topography of the cell. For this project, the topography of the cell was determined by maintaining a constant distance between the tip of the electrode and the surface of the cell. This distance was kept constant by measuring the impedance between the electrode tip and the reference electrode. By setting the potential of the SECM electrode to collector mode, neurotransmitter release was monitored by observing the changes in current at the tip of the electrode. A spike in current indicated the release of neurotransmitters from the cell surface. The goal of the project is to develop the SECM as a tool to study the biological effects of oxidative damage on rat pheochromocytoma cells (PC12 cells). The ultramicroelectrode probe can be used to generate the reactive oxygen species and subsequently monitor topographical changes to these cells as well as electrochemical changes on the surface of the cells.