**DEVELOPMENT OF EIS-BASED DEVICE SENSING EPIGENETIC CHANGES FOR EARLY CANCER DETECTION**

***ABSTRACT***

Cancer is an extensive group of diseases involving unregulated cell growth, and the molecular mechanism leading to this devastating disease is highly diverse. Therefore, defining the underlying cause at the early cancer pathogenesis will be the key to treat individual cancer cases more effectively. While cancer is likely developed by genetic mutations, epigenetic modulation appears to precede the genetic mutations, raising the intriguing possibility that cancer can be predicted and even prevented. Note that epigenetic components regulate gene activity without changing the DNA/genome sequence.

This project aims to build an EIS (electrochemical impedance spectroscopy)-based devise targeting one of the key epigenetic alterations, methylation of histones, using pre- developed/defined epigenetic resources in plants. The EIS-based device, due to its sensitivity and rapidity, will significantly advance the current medical capability of diagnosing cancer. Moreover, the EIS device monitoring epigenetic modifications has significant commercialization potential since almost 2 million new cancer cases are reported every year in the US. We foresee that the EIS device will help in lowering the treatment cost by learning the causal mechanism of cancer at the early stage, and that the demand for this diagnostic device and its commercial value will be significant. Since a few FDA-approved drugs targeting the histone modifications are already available, the EIS-device in this project will present an immediate solution to design cancer treatment tailored to individual cases. Furthermore, given that the EIS device is utilizing a simple protein-protein interaction, its adaptability to a broad range of biological research will be tremendous.

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