Machine Learning Tool for Early Detection of Small Cell Lung Cancer Using Novel Nuclear Factor I/B Expression: Drastically Increase Patient Survival in 1 Minute for 1 Dollar

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Around 1.6 million people die annually from lung cancer--about 3 every minute. The survival time of undiagnosed extended/late stage small cell lung cancer (SCLC), the most fatal lung cancer subtype, is only 2 to 4 months. Current diagnostic processes stain biopsies for general markers, not metastasis-specific ones; thus, treatment is not patient-specific and there could be misdiagnoses. There are no early detection tools for SCLC today. Nuclear Factor I/B, NFIB, was investigated, for the first time, in pursuit of a biomarker representative of metastasis. Immunohistochemistry assays of primary lung tumors and metastatic liver tumors showed overexpression of NFIB in SCLC metastases. The formation and progression of NFIB expression was analyzed using random tagging with fluorescent proteins. NFIB expression originates from within NFIB negative tumors, not separately, indicating NFIB expression is selected for in the metastatic process. Upon NFIB knockdown, the number of metastases decreased, highlighting the therapeutic potential of NFIB inhibitors. Finally, human NFIB-stained SCLC biopsies were analyzed using a bioinformatics image-processing algorithm to correlate NFIB expression with stage of SCLC. The machine-learning algorithm was trained using NFIB positive and NFIB negative images. Results showed NFIB expression level is representative of the stage of cancer; the tool is very accurate: over 99% sensitive and specific in classifying biopsies. Doctors can directly use this tool to, within 1 minute, learn about the metastatic potential of patients' tumors or more accurately diagnose SCLC for one dollar per test. This can increase patient survival by years and help save millions of lives.

Awards Won:
Second Award of $2,000