



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

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Project Title Nanowire Device to Detect Circulating Tumor Cells	
Abstract Objectives/Goals In the US, there are over 12 million people that live with cancer, but in about 90% of these cases, most patients die from the metastasis of the primary tumor. Detecting a metastasized tumor at an early stage still remains a challenge because of the limitations in current diagnostic techniques. In order to improve early detection for metastasis, a nanowire device was developed that could efficiently capture and release circulating tumor cells. Methods/Materials The device was fabricated from a unique nanowire silicon substrate and polydimethylsiloxane (PDMS). Biotinylated polymer brushes coated with anti-EpCAM were grafted onto the silicon nanowire substrate to capture circulating tumor cells (CTCs). Cells from prostate and breast cancer cell lines were suspended and were run through the device for each test. Results Using a coating of 10% biotin, the device had a capture efficiency of 70-90% and a high release rate. The nanowire device maintained a high viability of the cells and was able to accurately differentiate between different types of cancerous cells. For released cells, the viability rate was 90%, and CTCs were still viable to undergo additional culturing. The device's sensitivity was confirmed by its ability to successfully differentiate between EpCAM positive cell lines and EpCAM negative cell lines. The durability of the device was proven by its ability to be used multiple times. Conclusions/Discussion This nanowire device demonstrated the ability to capture and release CTCs at a high rate, accurately differentiate between different cell types, maintain its ability to capture and release the cells after multiple uses, and maintain the viability of the released cells. Not only can this device improve early detection for metastasis, but it can also provide a less invasive option for cancer diagnostics because capturing CTCs only requires a blood draw. With efficient CTC detection and less invasive methods, the nanowire device can lead to significant advancements in cancer diagnosis.	
Summary Statement A nanowire device that can efficiently capture and release circulating tumor cells was developed to improve the early detection of cancer.	
Help Received Mother provided transportation; used lab equipment at University of California Los Angeles	