Unique Collaboration Funded To Develop Nanotechnology For Melanoma

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A unique collaboration between electrical engineers, mechanical engineers and cancer researchers may be the perfect combination to improve diagnosis, treatment and follow-up of patients with melanoma.

Researchers at the University of Colorado Cancer Center, the University of Colorado at Boulder and the University of Texas at Dallas have received funding to develop a mechanical system the size of a wristwatch that will display the presence or absence of genetic signals of melanoma. The $1.1 million grant, funded over the next four years, was awarded by the National Science Foundation.

Engineers, working with cancer researchers, will use the funding attempt to "wire" and color code various genes using nanotechnology to screen blood samples. The goal is to help physicians and patients visualize changes that occur in melanoma cells that indicate important developments such as disease progression or response to therapy.

The development of a panel of melanoma-specific tumor markers through nanotechnology would significantly impact the way melanoma is diagnosed and treated because the tumor markers could be detected before a tumor had grown large enough to be detected using current imaging technology. Approximately 20 percent of patients who develop malignant melanoma die of metastases present at diagnosis but not detectable by any current imaging or biochemical techniques. Determination of who has, or will develop, cancer is an important step in the diagnosis, follow up and treatment of cancer.

Nanomachines can be engineered to sense and pick up molecular markers of cancer cells, enabling scientists to detect molecular changes even when they occur only in a small percentage of cells. The nanoparticles are used to detect the presence of genetic changes and relay the information via electrical connections to doctors and researchers. The connections will produce different colors for different biomarkers.

"Imagine going to your doctor, and with a device the size of a wristwatch, being able to know within five minutes whether or not certain molecular signs of melanoma are present in a blood sample," said Lynne Bemis, PhD, associate professor at UCCC and a lead researcher on the grant. "By 'seeing' at the very basic level if key biomarkers for melanoma are present and in what capacity, patients and their physicians will have valuable information about cell changes much earlier than current screening technologies do."

Bemis added that a nano device has the potential to not only show changes sooner than current technologies, such as PET (Positron Emission Tomography) Scanning, but would also be cost effective and more efficient. She emphasized that the device is years from its clinical debut, but this grant funding enables researchers to lay the groundwork that is critical to making the device a reality.

"From the engineer's point of view, nanotechnology is very exciting because it enables us to perform a variety of manipulations and operations directly at the size scale of the molecules linked to the disease. Better understanding the interaction of nanomaterials with various biomolecules will open doors to radically new ways to detect and intervene in disease processes," said Won Park, PhD, assistant professor at the University of Colorado at Boulder and the principal investigator of the grant.

Bemis and researchers in the William Robinson lab at the Anschutz Medical Campus in Aurora, Colo., have already identified several biomarkers for Park to build into the panel and color code in collaboration with Jeong-Bong Lee, PhD, associate professor at the University of Texas at Dallas. The UCCC researchers will continue to look for novel biomarkers so that the engineers in Boulder and Dallas can develop a truly comprehensive panel that will provide the most complete information about each patient's tumor. More information on this project can be found at the project's Web site, onchip.colorado.edu .

Source: University of Colorado