CANCER PREVENTION & RESEARCH INSTITUTE OF TEXAS

Award ID:
RP170366

Project Title:
Optimizing Chemoradiation Strategies by Tumor Metabolism Interrogation

Award Mechanism:
Individual Investigator

Principal Investigator:
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Entity:
The University of Texas M.D. Anderson Cancer Center

Lay Summary:

Despite continued improvements in chemotherapy and radiation regimens, we remain unable to adapt treatment protocols to actual tumor response, which leads to unnecessary treatment toxicity and suboptimal clinical effectiveness. We propose assessment of tumor metabolism to improve chemotherapy and radiation effectiveness. These treatments release free radicals (reactive oxygen species (ROS)), which when left unchecked, kill tumor cells. Tumors protect themselves by using metabolically generated free radical scavengers. Treatment-induced changes in metabolic activity can be measured biochemically. By analogy, treatment-induced ROS can be compared to a fast ship generating a wake in the water. The size of the wave is related to the energy of the ship; measurements of wave size can provide an indirect measure of the energy of the passing ship. We have demonstrated this effect in solid tumors. This proposal will demonstrate that the relationship between treatment selection and lactate (Lac) production is robust and generalizable across tumors, which vary in their molecular background. We will demonstrate that this relationship can be used to tailor treatment selection to the two most common cancer-causing events in head and neck cancer: mutation of the TP53 gene and activation of the human papilloma virus (HPV).

To translate these findings into the clinic, we will use magnetic resonance technology coupled with hyperpolarized metabolic tracers to detect acute changes in tumor cell and solid tumor metabolism following treatment. These effects correlate with biochemical measurements of tumor Lac production. Successful completion of this proposal will permit use of real-time metabolic imaging as a biomarker of radiation and chemotherapy response and development of broadly applicable adaptive treatment algorithms. The ability to adjust treatment parameters in real time may revolutionize clinical practice through the personalization of overall cancer patient treatment.