CANCER PREVENTION & RESEARCH INSTITUTE OF TEXAS

Award ID:
RP170752

Project Title:
Radiation-Induced Release of Chemotherapeutic Agents in Vivo

Award Mechanism:
High Impact/High Risk

Principal Investigator:
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Entity:
The University of Texas at Dallas

Lay Summary:

Cancers deep within the body are difficult to treat and once a cancer spreads from its original location, it becomes even harder to treat. Chemotherapy is used to address this issue because the body can distribute drugs nearly everywhere, meaning it can get treat cancers deep within the body. Unfortunately, chemotherapy also kills healthy cells, and when it is delivered like that, it is delivered throughout the body where it causes many of its well-known side effects, some of which can be life threatening. Recent work has focused on using light (usually a bright light bulb or a laser) to specifically release drugs right inside the tumor (called drug delivery), resulting in more chemotherapy in the tumor than the surrounding healthy cells. One problem with this is that light doesn't travel through the skin very far, so tumors deep inside the body are inaccessible to this technique. We are trying to overcome these issues in two ways. First, we are using radiotherapy to activate drug delivery as opposed to optical light. Radiotherapy is already used to treat patients and has unlimited tissue penetration, so it can get most tumors in the body. To do this, we had to figure out how to release drugs using ionizing radiation and it turns out that since ionizing radiation kills cells by breaking apart their RNA and DNA, why not just bind the drug to a ball of RNA? This way when the RNA breaks apart, the drug is released. Even better, the broken strands of RNA can help wake up the body's immune system inside the cancer. If that happens, and the cancer is recognized by the body as "foreign" then the patient's own immune system will help fight the cancer. The tricky part was finding a way to keep the body from immediately destroying the RNA. To do that, we used a phage capsid—the part of a certain type of virus that holds its genetic information. Don't worry—the virus is not infectious and the part we are using (derived from bacteriophage Qbeta) has been shown to be safe.