Penn Medicine

Emerging Research in Thoracic Oncology at the University of Pennsylvania

We are truly grateful for the partnership of the Rotz family and support from their dedicated family and friends. Your generosity has been essential to the thoracic oncology laboratories at Penn Medicine's Abramson Cancer Center undertaking a number of innovative research initiatives aimed at advancing the most promising new treatments for lung cancer.

CAR T Cell Therapy

We are advancing therapies for lung cancer and mesothelioma using genetically modified CAR T cells, derived from the patient's own white blood cells through gene therapy. These cells are programmed outside the body to target specific cancer cells before being reintroduced via injection to combat the disease internally. While CAR T cells have revolutionized treatment for blood cancers like leukemia and lymphoma, their application in solid tumors like lung cancer has been challenging. Our lab is focused on overcoming these challenges with support from the Rotz Foundation, preparing for an imminent clinical trial to advance this innovative treatment approach.

CAR T Cells Targeting Fibroblasts: From the Laboratory to Clinical Trial

In the past decade, we've developed CAR T cells to target cancer-supporting fibroblasts that shield lung and other cancers with scar tissue, hindering immune and drug access, promoting tumor growth, and suppressing anti-tumor immunity. Our FAP-CAR T cells, designed to attack the surface fibroblast activation protein (FAP), demonstrated significant tumor reduction in published studies. The challenge is to engineer the correct CAR T cell to recognize high-level FAP on cancer fibroblasts without damaging healthy cells, which express FAP at low levels. Now, supported by the Rotz Foundation, the National Cancer Institute, Penn Medicine's Dr. Carl June, and the Center for Cellular Immunology, we're preparing for a 2025 clinical trial. Recent tests against 6000 proteins for possible cross reactions confirm our antibody's specificity for FAP, meeting crucial safety criteria for FDA clearance. Promising results suggest enhancing treatment outcomes for lung, head and neck, and pancreas cancer patients with partial responses to standard therapies.

KATHLEEN M. ROTZ
The Kathleen M. Rotz Lung Cancer Research Fund

PENN MEDICINE MISSION

Penn Medicine, a non-profit organization, is a world-renowned institution dedicated to discoveries that will advance science and patient care throughout the world, and to the education of the physicians and scientists of tomorrow to carry on our legacy of excellence.

To learn more about how you can support Penn Medicine, please contact:

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While Building Upon Important Discoveries, We Continue to Develop Promising New Research Initiatives. . .

A. Generating CAR T Cells Inside the Body with a Simple Injection of mRNA:

We're collaborating on a groundbreaking project to revolutionize CAR T cell generation, aiming to simplify production, reduce costs, enhance safety, and expand treatment access. Leveraging innovative technology from Penn, we're exploring in-body CAR T cell development, eliminating the need for complex external manufacturing or chemotherapy pre-treatment.

Partnering with Nobel laureate Professor Drew Weissman, known for his mRNA vaccine technology, we're investigating mRNA particle injections to stimulate T cell production within the body. Initial success includes the formation of FAP CAR T cells post-injection, leading to tumor size reduction. Our ongoing efforts focus on optimizing this method and integrating it with complementary therapies.

B. Injection of mRNA Directly into Tumors to Stimulate the Immune System:

Over the years, our lab has pioneered treatments by injecting a modified cold virus to deliver an immunologic activator directly into tumors, achieving initial success. We aim to enhance and simplify this approach by using LNPs that carry an interferon message. Our research shows that injecting these mRNA particles can inhibit cancer growth in treated tumors and even shrink untreated tumors. We are currently refining strategies to optimize these therapeutic effects.

C. Using Red Blood Cells to Detect Lung Cancer:

In collaboration with a former Albelda Lab trainee, we have learned to recognize early-stage lung cancer DNA by analyzing a patient’s red blood cells, which are effective scavengers for tiny amounts of DNA released from tumor cells. Using PCR, a sensitive diagnostic technique (also used for COVID), we detect common lung cancer mutations, enabling early diagnosis and monitoring of therapy response.

Our research involves human tumors growing in mice and includes two clinical trials. The first analyzes blood from lung cancer patients before and after surgery, while the second examines blood before and after chemotherapy. Laboratory testing aims to detect and track cancer DNA levels, potentially aiding early lung nodule diagnosis.

Do You Know Your Immunity Vocab?

CAR: Chimeric Antigen Receptor
T Cells: Lymphocytes: White Blood Cells (Specific to Adaptive Immunity)
Leukocytes: White Blood Cells (All Types)
FAP-CAR T Cells: Fibroblast Activation Protein
Adenovirus: Modified Cold Virus
Interferon: Immunologic Activator