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CELL-BASED TUMOR TARGETING FOR DELIVERING THERAPEUTIC AND IMAGING AGENTS

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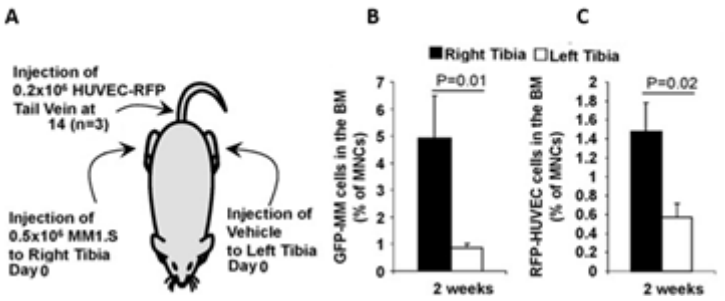
Researchers in Prof. Abdel Kareem Azab's laboratory have developed a biologically-targeted cellular drug delivery system to precisely target therapeutic or diagnostic agents to a wide range of cancers. Delivering drugs directly to cancer cells and not to healthy cells could improve outcomes by increasing efficacy and reducing adverse side effects. However, current tumor targeting strategies (e.g., antibodies or CAR-T cell therapy) rely on cell surface markers, limiting their targeting capacity to clones that express those specific markers.

This new theranostic system offers a more universal approach by hijacking the mechanism that all cancer cells use to grow: recruiting endothelial progenitor cells (EPCs) for angiogenesis. Because EPCs naturally home to tumors, they can be loaded with therapeutic or imaging agents and act as a "Trojan Horse" to deliver their cargo to detect or kill cancer cells. This highly specific and efficient biological machinery could be used across a wide range of hematologic malignancies and solid tumors with no genetic manipulation of the autologous cells.



In vivo validation: *EPCs home to tumors in mouse models of cancer*

Stage of Research

- *In vitro*:
  - EPCs migrate to media derived from 8 different types of cancer
  - EPCs loaded with Titanocene retained the ability to home to tumors and killed multiple myeloma cells in a dose-dependent fashion
- *In vivo mouse models*:
  - EPCs migrate to tumors in hematologic malignancies (multiple myeloma, lymphoma, chronic myeloid leukemia) and solid tumors (pancreatic, glioblastoma and lung cancer)
  - EPCs "primed" in hypoxic tumor media are better at homing to myeloma and glioblastoma

Applications

- **Cellular drug delivery** – EPCs loaded with therapeutic agent could precisely target chemotherapy or radiopharmaceuticals to tumors
- **Cancer imaging/diagnostics** – EPCs labeled with imaging agent could be used as a universal biomarker for a range of solid tumors an hematologic malignancies

Key Advantages

- **Precise targeting for a range of cancer cells –** specific targeting of either therapeutic or diagnostic/imaging agents
  - EPCs home to cancer cells and not normal tissue
  - EPCs home to all cancer types due to the universality of angiogenesis
  - Effective homing without relying on specific cell surface markers on the cancer cells
  - Can **cross blood brain barrier** to access glioblastoma or other brain cancer
  - Can home to both **primary and metastatic tumors**
  - Increased detection (for imaging) or efficacy (for therapeutics) with reduced adverse side effects
- **Minimal ex vivo manipulation:**
  - EPCs could be harvested and incubated with imaging or therapeutic agent for a few hours
  - no gene editing step
- **EPCs available in immunosuppressed patients –** patients with advanced tumors have a higher number of EPCs

Patent Application: US20200179520

Website: Azab Lab