Novel Immunotherapy to treat ovarian and other cancers

Overview
Ovarian cancer is the most deadly gynecologic malignancy. The American Cancer Society estimates 22,530 new diagnoses and 13,980 deaths in 2019. Approximately, 80% of individuals are diagnosed with advanced staged disease with a 5-year survival of only 40%. Patients with advanced ovarian cancer are treated with cytotoxic chemotherapy (carboplatin and paclitaxel), which has been the standard treatment for almost 30 years. Clearly, new and effective treatment options are needed. Unfortunately, the most effective new therapy for many other solid tumors, checkpoint inhibitors like pembrolizumab, have demonstrated little benefit in ovarian cancer.

Applications
- Treatment of ovarian cancer.
- Treatment of lung and colon cancers.
- Program vesicles to flip from M1 to M2, thus suppressing the pro-inflammatory response and the release of cytokines. Patients with serious COVID-19 infections are hurt by cytokine storms.

Advantages of MEVs
- Can be tailored to different sizes;
- Loaded with virtually any therapeutic or diagnostic cargo;
- Programmed with different surface components related to specific cell types including patient specific cancers;
- Can be rapidly and inexpensively produced with higher yields than typical exosome preparations.
- Also overcome major limitations of CAR-T therapies, which in some cases may target both cancerous and normal B cells.
- Other immunotherapies that for example target PD-1, can be prone to off-target adverse effects.

In-vivo studies in xenograft mouse models showed that the MEVs exhibit cancer specificity and targeting.

Invention
UK researchers have discovered a novel technology, Microphage derived Engineered Vesicles (MEVs), to both deliver chemotherapy directly to cancer cells and convert M2 tumor associated macrophages to M1 macrophages, sensitizing the cancer to immunotherapy.

Recent evidence shows that Endogenous extracellular vesicles, EEVs, from pro-inflammatory macrophages (M1) can alter anti-inflammatory macrophages, shifting them from M2 to M1 polarization. While EEVs are being evaluated as potential immunotherapies, low yields and complex separation procedures pose significant barriers to their use. These MEVs are a potential strategy that maintains the desirable properties of EEVs while overcoming feasibility challenges. We have demonstrated that MEVs can reprogram M2 (tumor associated macrophages) to a proinflammatory (anti-cancer) phenotype.

IP Status: Patent pending.
Development Status: Next Steps:
Streamline and scale-up manufacturing process for MEVs.
Identify the ideal MEV parameters.

Relevant Publications:

Lead Inventors:
Dr. Jill Kolesar
Professor College of Pharmacy, Director Precision Medicine Center at Markey Cancer Center, who has contributed to and/or published approximately 160 papers and 4 patents/patent applications. She previously co-founded Helix Diagnostics http://www.helixdiagnostics.com in 2001, based on two of these patents and has experience successfully raising venture capital.

Dr. Christopher Richards
Associate Professor of Chemistry, College of Arts and Sciences, who has contributed to and/or published more than 40 papers and 3 patents/patent applications.