

Nanotechnology Characterization Laboratory



February 2019

Twice per year the NCL accepts the most promising cancer nanomedicine candidates into its Assay Cascade characterization and testing program. Nanomedicines accepted into the program will undergo a rigorous evaluation that may include sterility and endotoxin testing, physicochemical characterization, in vitro hemato- and immunotoxicity, and in vivo studies to evaluate safety, efficacy and pharmacokinetics. The studies are tailored to each individual nanomedicine and are designed to promote the clinical translation of these novel therapies. **All studies are conducted free of charge for Awardees.**

Congratulations to the Following Awardees

Co-D Therapeutics Inc.

Co-D Therapeutics Inc. specializes in polymeric micelle nanotechnology for taxanes for injection and their drug combinations, seeking safety, solubility, stability and synergy for cancer therapy. In Asia, Genexol-PM® for injection is a 2nd generation paclitaxel based on poly(ethylene glycol)-*block*-poly(lactic acid) (PEG-*b*-PLA) micelles. Genexol-PM® is less toxic than Taxol®, enabling dosing at 260 versus 175 mg/m² for enhanced anticancer activity in humans. Co-D Therapeutics Inc. develops oligo(lactic acid) o(LA)_n-prodrugs for PEG-*b*-PLA micelles, expanding the role of PEG-*b*-PLA micelles from “solubilizer” into “nanocarrier” for taxanes for injection. In breast and NSCLC tumor-bearing mice, an o(LA)₈-paclitaxel prodrug-loaded PEG-*b*-PLA micelle (Paxola) is less toxic and more effective than a paclitaxel-loaded PEG-*b*-PLA micelle (i.e., Genexol-PM®), owing to added plasma and tumor exposure, followed by conversion into paclitaxel. Under this NCL collaboration, the goal is to characterize Paxola, focusing on its physicochemical properties, pharmacokinetics, safety and efficacy, towards an Investigational New Drug (IND) application.

<https://co-drx.com/>

Prof. Stathis Karathanasis, Case Western Reserve University

We have developed a new class of multicomponent nanoparticles that can effectively deliver drugs to hard-to-reach tumors. The drug cargo of the nanoparticle remains stable for hours in blood circulation, while drug release can be triggered by an external radiofrequency (RF) field using low-power magnetic fields at frequencies of 10–50 kHz as an external trigger. When exposed to alternating RF fields, the nanoparticle’s mechanical tumbling releases the drug molecules from the particle. After the nanoparticle deposits to the altered endothelium of the disease, RF triggers rapid drug release facilitating wide distribution of drug delivery throughout the tumor volume. These multicomponent nanoparticles have the potential to allow significant therapeutic outcomes against cancers where success is currently very limited (e.g., brain tumors, pancreatic cancer, cancer metastasis).

<http://engineering.case.edu/research/labs/cancer-nanotechnology>

**Frederick National Laboratory
for Cancer Research**

Congratulations to the Following Awardees (continued)

Prof. Matthias T. Stephan, Fred Hutchinson Cancer Research Center

Tumor-associated macrophages (TAMs) usually express an M2 phenotype, which enables them to perform immunosuppressive and tumor-promoting functions. Reprogramming these TAMs toward an M1 phenotype could thwart their pro-cancer activities and unleash anti-tumor immunity, but efforts to accomplish this are nonspecific and elicit systemic inflammation. Our group developed a targeted nanocarrier that can deliver *in vitro*-transcribed mRNA encoding M1-polarizing transcription factors to reprogram TAMs without causing systemic toxicity. Implemented in the clinic, this new immunotherapy could enable physicians to obviate suppressive tumors while avoiding systemic treatments that disrupt immune homeostasis.

<https://www.fredhutch.org/en/labs/profiles/stephan-matthias.html>

Drs. Lily Yang and Lei Zhu, Department of Surgery and Winship Cancer Institute, Emory University School of Medicine, and MIGRA-Therapeutics, LLC, Atlanta, GA

Poor efficiency in drug delivery is a major challenge in cancer treatment. It is well recognized that the dense stromal barrier in solid human tumors limits drug delivery into tumor cells. Translational investigators at Emory University and MIGRA-Therapeutics, LLC, have developed a novel targeted and stroma breaking nanoparticle drug delivery platform to improve intratumoral delivery and distribution of potent cancer therapeutic agents. This research team has demonstrated significant enhancement in nanoparticle-drug delivery and therapeutic response in human cancer patient tissue derived xenograft (PDX) models and mouse tumor models. In collaboration with the Nanotechnology Characterization Laboratory (NCL) at the NCI, the group will conduct important preclinical studies for translation of this targeted therapy into a phase I clinical trial for the treatment of advanced pancreatic cancer.

http://www.surgery.emory.edu/about-us/faculty_directory/faculty_profile_lily_yang.html

If you are interested in learning more about the NCL's services, please visit our website, <https://ncl.cancer.gov>, or contact us for more information, ncl@mail.nih.gov. **The next application deadline is March 1, 2019.**