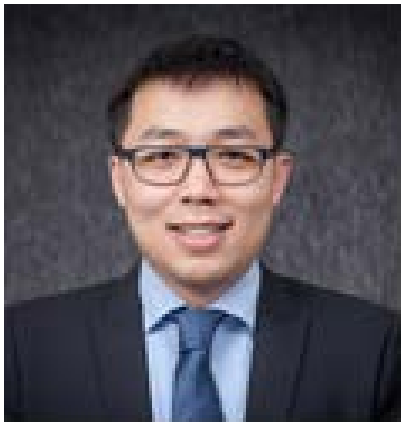
UCLA Engineering
HENRY SAMUELI SCHOOL OF
ENGINEERING AND APPLIED SCIENCE

BIOENGINEERING

PRESENTS

Use of nano-enabled bioengineered approaches for the treatment of pancreatic cancer and rare muscle disease



THURSDAY, Jan. 24, 2019
12:00 – 1:00 PM
2101 ENGINEERING V

Huan Meng, Ph.D.
UCLA
Assistant Professor,
Department of Medicine

ABSTRACT:

Given the heterogeneity of the tumor microenvironment in pancreatic cancer (PDAC), it is necessary for therapeutic nanoparticles to consider engineered approach for effective cancer treatment. To illustrate this approach, we are using tailor designed nanocarriers for improved chemo- and immunotherapies of PDAC, employing a "silicasome" platform that is comprised of mesoporous silica nanoparticles (MSNP) coated with a lipid bilayer (LB). Depending on chemical structure, we have demonstrated diverse methods for drug encapsulation in silicasomes, including: 1) encapsulation of a hydrophilic drug such as gemcitabine (GEM) into the porous interior; 2) incorporation of a hydrophobic drug such as paclitaxel (PTX) into the LB; 3) ratiometric co-delivery of GEM/PTX, and 4) remote loading of weak base drug such as irinotecan. To improve drug delivery, we address vascular access in PDAC, where a dense stroma and pericyte coverage of vasculature fenestrations extensively block access of nanoparticles. Using an engineered approach, we showed that "2-wave" therapy can deal with pericyte coverage in the 1st wave, allowing vascular egress of the 2nd drug delivery nanocarrier in PDAC. It is also possible to use a transcytosis-inducing iRGD peptide to improve particle PDAC concentration in a tumor fenestration-independent fashion. We continue to demonstrate in the subcutaneous, orthotopic and patient derived PDAC models that silicasomes can improve the PK and efficacy, outperforming free drug and commercial nanocarriers (i.e. Onivyde®, ABRAXANE®). From the safety perspective, we showed that silicasome dramatically improved safety over the classic liposome (that is non-supported). Recently, we used MSNP for oxaliplatin to engage immunogenic cell death (ICD), concurrent with co-delivery of a metabolic checkpoint inhibitor that targets IDO pathway. Our co-delivery particle induced effective innate and adaptive anti-PDAC immunity. Significant tumor eradication is accomplishable by recruiting cytotoxic T cells, concomitant with downregulation of Treg cells. We are expanding the pharmaceutical bioengineering studies for other cancer types and non-cancer diseases, i.e. a CRISPR/Cas9 platform delivery in Duchenne Muscular Dystrophy.

BIOGRAPHY:

Dr. Meng is an Assistant Professor in the Division of NanoMedicine at UCLA, where he conducts multidisciplinary nanotherapeutic research in the medical school and California NanoSystems Institute (CNSI). Huan received his B.S. and Ph.D. degrees in Peking University and Chinese Academy of Sciences, respectively. He moved to US in 2008, formerly as a research fellow and since 2013 as a faculty in the Department of Medicine. Huan is the member of JCCC Cancer Center, CNSI and Center for Duchenne Muscular Dystrophy. Huan's research interests are nanomedicine, pharmaceutical bioengineering and nano/bio interface, with a specific focus on nanotherapy in cancer and recently in rare muscle disease. His productivity and work impact were recognized by Clarivate Analytics' inclusion in 2018 as a "Highly Cited Researcher" (Top 1%) in the "Cross-Field" category. Huan

is a prolific inventor and frequently invited speaker. His intellectual property filing has contributed to the founding of two startup companies. studies. He is currently leading multiple NIH center projects on creating the 3D single-cell maps for multiple human organs, including brain, lung, kidney and bladder. He also co-founded Singlera Genomics Inc. focusing on non-invasive early cancer screening and detection