SEMINAR SERIES

Supported by The Department of Biomechanics and
The Center for Research in Human Movement Variability (MOVCENTR)

USING CELL PRIMING AND MODELING TO UNDERSTAND AND ENHANCE NONVIRAL GENE DELIVERY TO STEM CELLS FOR CRISPR AND EXOSOME APPLICATIONS

Featuring Dr. Angela Pannier

University of Nebraska-Lincoln

February 5th, 2021 | 12:00 - 1:00 pm

Zoom Link: https://unomaha.zoom.us/j/93350193271

ABOUT DR. PANNIER

Dr. Angela K. Pannier, Maxcy Professor of Agriculture and Natural Resources, is a Professor of Biomedical Engineering in the Department Biological Systems Engineering at the University of Nebraska-Lincoln (UNL), with a Courtesy Appointment in the Mary and Dick Holland Regenerative Medicine Program at the University of Nebraska Medical Center. Dr. Pannier's NIH/NSF/USDA supported research focuses on engineering biomaterials and systems for gene therapy and tissue engineering applications. In 2017 she worked as a visiting scholar at the Leibniz-Institut für Polymerforschung in Dresden, Germany. She is an active member of the American Institute of Chemical Engineers, Biomedical Engineering Society, and American Society of Gene and Cell Therapy. Dr. Pannier serves as an Associate Editor for *Science Advances,* and serves on the editorial boards for *Experimental Biology and Medicine* and *Regenerative Medicine Frontiers.* Dr. Pannier was awarded the 2017 NIH Director's New Innovator Award for her pioneering work in gene delivery. In 2019 she was awarded a Presidential Early Career Award for Scientists and Engineers (PECASE) from the White House Office of Science and Technology Policy and is the first Nebraskan to earn this honour. In 2020 she was named a Fellow of the Biomedical Engineering Society. She holds a BS and MS in Biological Systems Engineering from UNL and a PhD from Northwestern University.

PRESENTATION ABSTRACT

In our work, we have used microarray analysis of transfected cells to identify molecular mediators of nonviral gene delivery as potential endogenous targets for rational design of carriers, and are developing the idea of "cell priming" of those targets as a simple and clinically translatable strategy for improved gene transfer. In cell priming, a pharmacologic agent is delivered to cells prior to delivery of DNA to modify cellular responsiveness to gene transfer. In addition to increasing understanding of transfection, identification of cell priming strategies that dramatically enhance transfection efficiencies promises to lead to simple new gene delivery protocols, applicable to many carrier and cell types. To increase our library of priming candidates, we have performed large-scale screens of clinically approved drugs to identify new priming targets and agents and have identified glucocorticoids as a class of cell priming adjuvants that significantly enhance transfection in human mesenchymal stem cells (hMSCs). We have also developed a new mathematical model to describe the process of gene delivery based on telecommunications theory, where delivery of DNA to the cell nucleus is analogous to delivery of a packet of information (DNA) to a destination computer (nucleus) within a random, packet-switched computer network (cell). Outputs from this new model show agreement with experimental data and we are using the model to make *a priori* predictions, to identify improvements to gene delivery systems and guide designs of therapeutically relevant carriers, to improve DNA delivery to hMSCs for applications ranging from exosome production to cell therapies enabled by gene editing.

more info at **cobre.unomaha.edu**

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