

# CARNEGIE MELLON UNIVERSITY

## BME 2024 FALL SEMINAR SERIES

### Porcine model to the rescue! Oink-credible drug delivery models and approaches to inner ear



#### PRESENTED BY

##### **Adele Moatti, Ph.D.**

Assistant Professor, PHRC  
Otolaryngology Department  
University of Pittsburgh  
School of Medicine

#### SCHEDULE

**Porter Hall (PH) 100**

**Thursday,  
November 14, 2024  
(9:30-10:30AM)**

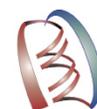
Despite promising studies in areas like hair cell regeneration and gene therapy, effective treatments for hearing loss remain limited. A significant challenge lies in translating findings from basic science in small animal models to human clinical trials. This often results from developing drugs without adequate consideration of drug delivery systems and models, highlighting the urgent need for reliable translational models and effective drug delivery strategies.

Enter pigs! Pigs are an excellent translational model for developing drug delivery systems due to their cochlear similarities to humans. This resemblance allows researchers to study drug delivery challenges in a context that closely mirrors human anatomy and function.

The primary hurdle in drug delivery is achieving a therapeutic dose across the blood-labyrinth barrier without causing systemic side effects. While local administration routes present alternatives, they come with drawbacks, such as the risk of temporary or permanent hearing loss and limited efficacy. When drugs are injected into the middle ear, they must pass through the round window membrane (RWM) to reach the inner ear, yet drug permeability and residence time in the "niche" leading to the RWM are often inadequate.

Our innovative approach tackles these challenges by: 1) utilizing natural vesicles released by the RWM to bypass biological barriers and effectively deliver drugs to the inner ear, and 2) identifying and modulating the pathways and receptors involved in the immune response that influence drug passage to the inner ear, thereby improving efficiency.

In conclusion, by leveraging pigs as a translational model and enhancing drug delivery strategies, we aim to bridge the gap between experimental treatments and clinical applications for hearing loss, ultimately leading to more effective therapeutic options for patients.



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