Clearing the Lungs with Ciliogenesis: New Treatment for Asthma and COPD  
Featured Innovator: Mahila Zahid, MD, PhD

In the lining of the airway, hair-like cilia sweep foreign matter, microbial contaminants, and mucus away. This clearance action is necessary for healthy lung function. Smoking, aging, and genetic mutations can compromise cilia action in the airway, leading to common respiratory illnesses, such as chronic obstructive pulmonary disease (COPD) and asthma, which together affect about 500 million people worldwide. By restoring ciliary robustness in the airway, the Notch antagonist DAPT could lessen ongoing lung damage from these chronic diseases.

Technology Description
DAPT inhibits proteolytic cleavage of Notch, which is the transcription factor responsible for transforming epithelial cells — where cilia sprout — into mesenchymal cells. By pushing the balance toward ciliated epithelial tissue, DAPT may improve lung clearance. In \textit{in vitro} experiments with mouse tracheal tissue, DAPT increased the number, length, and beat frequency of cilia three fold. Beyond respiratory illness, DAPT may also be useful for treating hydrocephalus — retention of fluid in the ventricles of the brain — by increasing cilia action to help with drainage.

Advantages
- Entirely new way of treating common respiratory diseases
- Cilia play a role in the function are many body systems, so DAPT could be broadly therapeutic

Applications
- COPD
- Primary ciliary dyskinesia (PCD)
- Asthma
- Emphysema
- Cystic Fibrosis
- Hydrocephalus

Stage of Development
\textit{ex vivo} data

IP Status
PCT patent application filed
After medical school, Dr. Zahid did her residency at Barnes Hospital at the University of Washington at St. Louis. She then completed a cardiology fellowship at the University of Pittsburgh Medical Center. After finishing her cardiology fellowship training, she pursued a PhD at the department of Human Genetics at the University of Pittsburgh’s School of Public Health. She is interested in identifying gene mutations responsible for disrupting normal cardiac development and leading to various forms of congenital heart disease. Her other interests are studying the role various transcription factors play in ciliogenesis and developing a cardiac targeting peptide as a novel, first in its class cardiac vector.

**Education**
PhD in Human Genetics  
University of Pittsburgh

MD  
Aga Khan University, Pakistan

**Publications**


