Department of Otolaryngology-
Head and Neck Surgery
UNIVERSITY OF WISCONSIN
SCHOOL OF MEDICINE AND PUBLIC HEALTH

Transforming Care for Patients with Voice, Airway, and Swallowing Disorders

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RESEARCH FOCUS

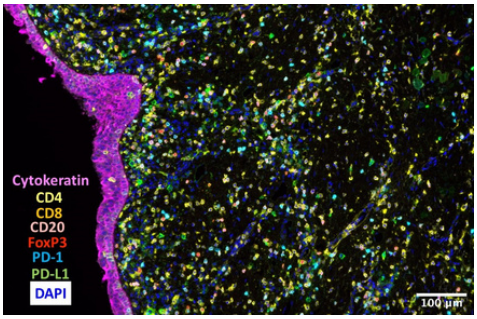
Ruth Davis, MD

Every breath, every conversation, and every shared meal depends on the complex function of the larynx. When injury or disease affects the airway and voice box, the consequences can be life-altering, impacting a person's ability to breathe, speak, and swallow.

Dr. Ruth Davis, Assistant Professor in the Division of Laryngology at UW-Madison, is advancing research that aims to restore these essential functions and improve quality of life for patients with voice, airway, and swallowing disorders. Combining clinical care with expertise in immunology, wound healing, and tissue engineering, her research seeks to better understand how airway injuries develop and how they can be prevented, treated, and ultimately cured. Her work has earned support from the National Institutes of Health, American Academy of Otolaryngology-Head and Neck Surgery Foundation, the Burroughs Wellcome Fund, the Triological Society, and the Wisconsin Partnership Project

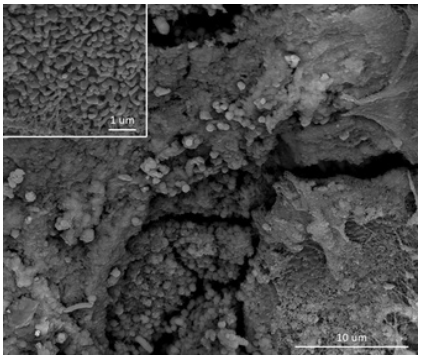
ADVANCING NEW SOLUTIONS FOR AIRWAY DISEASE

A major focus of Dr. Davis's research is laryngotracheal stenosis, a condition in which scarring narrows the airway and can leave patients dependent on repeated surgeries or a lifelong tracheostomy. Many of these injuries occur after life-saving intubation in intensive care units. As more patients survive critical illness, an increasing number face long-term challenges with breathing, voice, and swallowing.



Multiplex immunofluorescence highlights infiltrating immune cells in a patient with airway stenosis.

Through patient-centered translational research, Dr. Davis's team is working to understand why some patients heal normally while others develop severe scarring. Her laboratory studies patient samples, advanced disease models, and the body's immune response to identify new therapeutic targets that could prevent laryngeal damage before it becomes permanent.



Electron microscopy demonstrates biofilm on an endotracheal tube following removal from a patient's airway.

Dr. Davis is also investigating idiopathic subglottic stenosis, a rare and poorly understood disease that causes progressive narrowing of the airway below the vocal cords, making it increasingly difficult to breathe. Current treatments often require repeated surgical intervention, yet the underlying cause remains unknown. Her research aims to uncover the biological drivers of the disease and accelerate the development of therapies that could offer patients lasting relief

NEW APPROACHES TO PREVENT LARYNGEAL CANCER

Laryngeal cancer is another focus of Dr. Davis's research program. The treatment of laryngeal cancer must balance the functional impact of removing delicate vocal cord tissue with the risk of leaving behind life-threatening cancer cells. Surgery is the only treatment for precancerous vocal cord lesions that can prevent progression to cancer. Dr. Davis's research aims to understand the cellular drivers of progression from precancerous lesion to vocal cord cancer, with a goal of developing new targeted therapies to prevent the development of laryngeal cancer while preserving vocal function.

RECENT BREAKTHROUGHS

Dr. Davis and her collaborators have achieved several important milestones that are accelerating progress in airway disease research, including:

- Developing the first mouse model of intubation-related laryngeal injury, creating a critical platform for studying disease mechanisms and testing new therapies
- Identifying biological pathways involved in airway wound healing and scar formation
- Advancing the understanding of how the airway microbiome influences healing after injury
- Expanding research efforts that combine immunology, fibroblast biology, and tissue engineering to develop novel treatments for airway disease
- Generating foundational data that will support future clinical trials and therapeutic innovation

HOW PHILANTHROPY CAN ACCELERATE DISCOVERY

While federal funding supports many aspects of Dr. Davis's research, philanthropy provides critical flexibility to pursue innovative ideas and high-risk, high-reward projects that are often difficult to fund through traditional grant mechanisms.

Philanthropic support will help:

- Collect and analyze patient tissue and microbiome samples
- Fund advanced genomic technologies, including single-cell RNA sequencing
- Identify the specific genes and cell populations involved in scar formation
- Evaluate promising immune-modulating therapies in preclinical models
- Generate the data needed to launch future clinical trials
- Purchase laboratory supplies and specialized research equipment
- Support undergraduate, graduate, medical student, and postdoctoral trainees
- Pursue bold new research directions that could transform the treatment of rare airway disorders

A COMMITMENT TO PATIENTS AND DISCOVERY

Dr. Davis cares for patients every day who are facing some of the most challenging moments of their lives. While cures are not always available today, her research is helping move the field closer to better treatments and, ultimately, cures. This work offers hope to patients and families by advancing understanding of airway injury, scar formation, and disease progression. Philanthropic support enables Dr. Davis and her team to explore innovative ideas, take risks, and accelerate discoveries that could change lives. For patients who lose the ability to breathe easily, communicate, or share a meal with family and friends, the impact on quality of life can be enormous.

Every contribution helps advance research aimed at restoring these essential functions and improving the future for patients facing these conditions.

To learn more or explore giving opportunities, please contact Danielle Kamps, Senior Director of Development 608.224.9413 | danielle.kamps@supportuw.org