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PRIZE FOR NEUROBIOLOGY

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2024 Winner: Laura Seeholzer, Ph.D.

Laura Seeholzer is a neurophysiologist investigating how our airways sense external threats. Following degrees in Entomology and Biology from Cornell University, she earned her Ph.D. with Dr. Vanessa Ruta at The Rockefeller University, studying the evolution of neural circuitry underlying species-specific behaviors. During her post-doctoral studies with Dr. David Julius at the University of California, San Francisco, she described the molecular and cellular mechanisms by which airway neuroendocrine cells detect and clear noxious aspirated stimuli. Her work, which is supported by Helen Hay Whitney and IRACDA fellowships and funding from the NIH and Tobacco Related Disease Research Program, illustrates how sensory epithelial cells and neurons collaborate to execute essential, life-saving reflexes.

Essay: "(Don´t) Take My Breath Away"

When water "goes down the wrong pipe" or stomach acid is refluxed into our airways, most people have an immediate and strong reaction: they start coughing, gagging and swallowing. An inability to clear these and other noxious stimuli can lead to trouble breathing, aspiration pneumonia or lung damage. Sensory neurons play an important role in initiating protective reflexes by directly detecting the external environment, but they can also be activated by sentinel cells embedded within the epithelium. We found that tracheal and laryngeal neuroendocrine (NE) cells, a rare epithelial cell type, directly detect two noxious aspirated stimuli: water and acid. Upon stimulation, NE cells release a specific type of neurotransmitter that activates nearby sensory neurons, which then drives protective reflexes like swallowing and coughing. Our research identifies laryngeal and tracheal NE cells as a critical, previously overlooked cell population that protects our airways. In the future, it will be important to understand whether NE cell dysregulation contributes an increased likelihood of aspiration as people age or in diseases where critical airway reflexes are compromised.

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