



PROGRAM

10:45 - 11:00 a.m. Tea, Coffee and Treats

11:00 - 11:45 p.m. Lecture (typical)

11:45 - 12:00 p.m. Q&A and Discussion

ABSTRACT

Nasal airflow is important for the many physiological functions of the nose, which include: the warming and humidifying of inspired air, the filtration of airborne pollutants and the sense of smell and nasal pungency. The anatomical design of the nose reflects its functional needs. Inside the nose of most terrestrial mammals lies an intricate turbinate structure that diverges nasal airflow into parallel channels where its large surface area is optimal for trapping airborne particles and chemicals, for heat and gas exchange and for chemical interaction with olfactory and trigeminal receptors. Yet, such structure-function interaction has not been well characterized, as objective evaluation tools are lacking.

This seminar will introduce a nasal cavity rapid prototyping technique that is anatomical-accurately based on CT scans pioneered by our group. Coupled with computational fluid dynamic (CFD) modeling, it has shown great promise to evaluate and predict the impact of nasal morphology and its pathologic alteration on nasal airflow and mass transport in human and other mammalian species and eventually, to correlate with their nasal functions. In particular, I will focus on the application of such nasal CFD technique on a few basic and translational research topics related to chemosensory functions: (1) predicting the degree to which inflammatory conditions or anatomical features of the nasal airways will affect local airflow patterns and thereby impair olfactory function; (2) simulating and optimizing sinus surgical procedures to improve local airflow to areas which subserved olfaction and perceived nasal patency; (3) exploring the nasal structure-olfaction function optimization in rodent and other mammals. In the future, I envision the use of nasal airflow models can be a valuable tool in many other broader areas: for interspecies comparison, where animal models and data can help to understand and quantify transport problems in the human nose; setting guidelines for safe levels of human exposure to inhaled materials; and designing palatable food, flavor or drug delivery systems that can target desirable nasal regions.

SEMINAR TITLE

"The Way the Wind Blows - Implications of Modeling Nasal Airflow"

SEMINAR SPEAKER

Dr. Kai Zhao

Post-doctoral Associate

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Philadelphia,

PA

BIOGRAPHIC PROFILE



Dr. Kai Zhao earned his B.S. in Biomedical Engineering from Zhejiang University (China) in 1996, and M.S.E. and Ph.D. in Bioengineering from University of Pennsylvania in 1999 and 2004 respectively. He is currently a postdoctoral fellow at Monell Chemical Senses Center (Philadelphia), which is a non-profit independent scientific institute dedicated to interdisciplinary research on the senses of taste, smell, and chemosensory irritation. Dr. Zhao's current research focused on quantifying airflow and mass transport in human and animal nose and correlating nasal airway morphology in healthy and diseased population to its alteration on nasal function. He has received awards for his translational research at several medical conferences and a NIH-NIDCD early career funding. In his spare time, Dr. Zhao enjoys playing tennis and running, and is constantly hallucinating on the slim chance of qualifying for the Boston Marathon.