

# Mechanical Engineering Department Seminar

3:30pm October 28, 2009  
1130 Mechanical Engineering

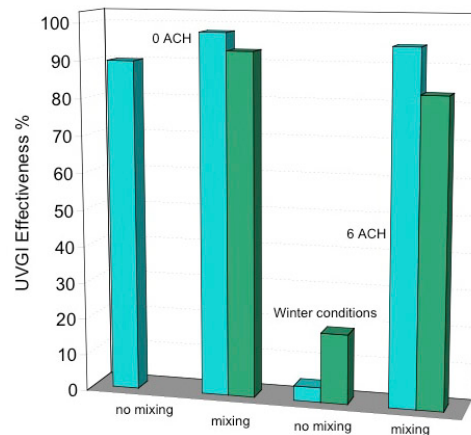


## Ultraviolet Germicidal Irradiation for Reducing Disease Transmission and Energy Use

Shelly L. Miller

Associate Professor, Department of Mechanical Engineering, University of Colorado

Airborne transmission of infectious agents within indoor environments has been a recognized hazard for decades. Engineering controls such as ventilation and negative pressure have been helpful for control of airborne infectious agents in high-risk settings such as hospital isolation rooms. Increasing energy costs associated with providing adequate ventilation has prompted renewed interest in other means to remove airborne infectious agents from room air, such as the application of ultraviolet germicidal irradiation (UVGI). One application of UVGI is to irradiate the air in the upper part of a room while minimizing radiation exposure to persons in the lower part of the room. Another application is to irradiate the air moving through ventilation ductwork. The aim of our research program, funded by grants from the CDC and Gilbert Foundation, is to systematically investigate the conditions under which UVGI can be expected to mitigate the spread of infectious agents. Results from detailed experiments conducted during the last 10 years will be discussed. In summary, upper-room UVGI is very effective at inactivating most species of airborne bacteria, but not fungi, at the levels provided to our test room. UVGI installed in ventilation ductwork can effectively inactivate both airborne bacteria and fungi at moderate air velocities, but not at high velocities due to reduced residence times. In addition it requires relatively lower energy inputs compared to ventilation.



**Bio** Dr. Miller is an Associate Professor of Mechanical Engineering at the University of Colorado. She is also an active faculty member of the interdisciplinary Environmental Engineering Program at CU. Her research interests lie in indoor air quality, health effects and exposure to particulate air pollution, and development and evaluation of indoor air quality control measures. Dr. Miller's current research projects include engineering controls for reducing exposures to infectious diseases, source apportionment of ambient PM<sub>2.5</sub> and association with health effects, association of coarse particles with health effects in urban and rural areas, characterization of environmental conditions in immigrant housing, characterizing ultrafine particles that penetrate into mechanically ventilated buildings, and bioaerosol characterization and control. Dr. Miller has received funding for her research program from the US EPA, CDC, NIOSH, NSF, NIH, and various private foundations and industry sponsors. Dr. Miller received the Chancellor's Postdoctoral Fellow from the University of Colorado in 1996. In 2000, she received an Environmental Achievement Award from the US EPA Region 8 for her work assessing indoor air quality in schools. Dr. Miller received her B.S. in Applied Mathematics from Harvey Mudd College and M.S. and Ph.D. degrees in Civil Engineering from the University of California, Berkeley.