

# Aerosolized Red-Tide Toxins (Brevetoxins) and Asthma\*

Lora E. Fleming, MD, PhD, MPH, MSc; Barbara Kirkpatrick, EdD;  
Lorraine C. Backer, PhD, MPH; Judy A. Bean, PhD; Adam Wanner, MD, FCCP;  
Andrew Reich, MS; Julia Zaias, DVM, PhD; Yung Sung Cheng, PhD;  
Richard Pierce, PhD; Jerome Naar, PhD; William M. Abraham, PhD; and  
Daniel G. Baden, PhD

**Background:** With the increasing incidence of asthma, there is increasing concern over environmental exposures that may trigger asthma exacerbations. Blooms of the marine microalgae, *Karenia brevis*, cause red tides (or *harmful algal blooms*) annually throughout the Gulf of Mexico. *K brevis* produces highly potent natural polyether toxins, called *brevetoxins*, which are sodium channel blockers, and possibly histamine activators. In experimental animals, brevetoxins cause significant bronchoconstriction. In humans, a significant increase in self-reported respiratory symptoms has been described after recreational and occupational exposures to Florida red-tide aerosols, particularly among individuals with asthma.

**Methods:** Before and after 1 h spent on beaches with and without an active *K brevis* red-tide exposure, 97 persons > 12 years of age with physician-diagnosed asthma were evaluated by questionnaire and spirometry. Concomitant environmental monitoring, water and air sampling, and personal monitoring for brevetoxins were performed.

**Results:** Participants were significantly more likely to report respiratory symptoms after *K brevis* red-tide aerosol exposure than before exposure. Participants demonstrated small, but statistically significant, decreases in FEV<sub>1</sub>, midexpiratory phase of forced expiratory flow, and peak expiratory flow after exposure, particularly among those participants regularly using asthma medications. No significant differences were detected when there was no Florida red tide (*ie*, during nonexposure periods).

**Conclusions:** This study demonstrated objectively measurable adverse changes in lung function from exposure to aerosolized Florida red-tide toxins in asthmatic subjects, particularly among those requiring regular therapy with asthma medications. Future studies will assess these susceptible subpopulations in more depth, as well as the possible long-term effects of these toxins.

(CHEST 2007; 131:187-194)