

Initial Evaluation of the Effects of Aerosolized Florida Red Tide Toxins (Brevetoxins) in Persons with Asthma

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Abstract

Florida red tides annually occur in the Gulf of Mexico, resulting from blooms of the marine dinoflagellate *Karenia brevis*. *K. brevis* produces highly potent natural polyether toxins, known as brevetoxins, that activate voltage-sensitive sodium channels. In experimental animals, brevetoxins cause significant bronchoconstriction. A study of persons who visited the beach recreationally found a significant increase in self-reported respiratory symptoms after exposure to aerosolized Florida red tides. Anecdotal reports indicate that persons with underlying respiratory diseases may be particularly susceptible to adverse health effects from these aerosolized toxins. Fifty-nine persons with physician-diagnosed asthma were evaluated for 1 hr before and after going to the beach on days with and without Florida red tide. Study participants were evaluated with a brief symptom questionnaire, nose and throat swabs, and spirometry approved by the National Institute for Occupational Safety and Health. Environmental monitoring, water and air sampling (i.e., *K. brevis*, brevetoxins, and particulate size distribution), and personal monitoring (for toxins) were performed. Brevetoxin concentrations were measured by liquid chromatography mass spectrometry, high-performance liquid chromatography, and a newly developed brevetoxin enzyme-linked immunosorbent assay. Participants were significantly more likely to report respiratory symptoms after Florida red tide exposure. Participants demonstrated small but statistically significant decreases in forced expiratory volume in 1 sec, forced expiratory flow between 25 and 75%, and peak expiratory flow after exposure, particularly those regularly using asthma medications. Similar evaluation during nonexposure periods did not significantly differ. This is the first study to show objectively measurable adverse health effects from exposure to aerosolized Florida red tide toxins in persons with asthma. Future studies will examine the possible chronic effects of these toxins among persons with asthma and other chronic respiratory impairment. *Environ Health Perspect* 113:650-657 (2005).