

Characterization of Marine Aerosol for Assessment of Human Exposure to Brevetoxins

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Abstract

Red tides in the Gulf of Mexico are commonly formed by the fish-killing dinoflagellate *Karenia brevis*, which produces nine potent polyether brevetoxins (PbTx). Brevetoxins can be transferred from water to air in wind-powered white-capped waves. Inhalation exposure to marine aerosol containing brevetoxins causes respiratory symptoms. We describe detailed characterization of aerosols during an epidemiologic study of occupational exposure to Florida red tide aerosol in terms of its concentration, toxin profile, and particle size distribution. This information is essential in understanding its source, assessing exposure to people, and estimating dose of inhaled aerosols. Environmental sampling confirmed the presence of brevetoxins in water and air during a red tide exposure period (September 2001) and lack of significant toxin levels in the water and air during an unexposed period (May 2002). Water samples collected during a red tide bloom in 2001 showed moderate-to-high concentrations of *K. brevis* cells and PbTx. The daily mean PbTx concentration in water samples ranged from 8 to 28 µg/L from 7 to 11 September 2001; the daily mean PbTx concentration in air samples ranged from 1.3 to 27 ng/m³. The daily aerosol concentration on the beach can be related to PbTx concentration in water, wind speed, and wind direction. Personal samples confirmed human exposure to red tide aerosols. The particle size distribution showed a mean aerodynamic diameter in the size range of 6-12 µm, with deposits mainly in the upper airways. The deposition pattern correlated with the observed increase of upper airway symptoms in healthy lifeguards during the exposure periods. *Environ Health Perspect* 113:638-643 (2005).