A Case-Control Study of ALS in Eastern North Carolina: Investigating the Role of Algae and Pesticides in a Region of High ALS Mortality

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Background: The development of amyotrophic lateral sclerosis (ALS) has been associated with both genetic and environmental factors. In particular, there is concern that exposure to toxins produced by cyanobacterial harmful algal blooms (CHABs) and agricultural chemicals may increase ALS risk. Our study investigates a region of North Carolina with relatively high ALS mortality rates that is near identified algal blooms and high agricultural activity.

Methods: We identified a high-mortality, near-blooms Eastern NC region and a low-mortality, far-from-blooms Central NC region. We collected responses from an environmental exposure survey for four groups enrolled at the Duke ALS Clinic: ALS Eastern (N=8), ALS Central (N=16), Healthy Eastern (N=3), and Healthy Central (N=8).

Results: ALS Eastern subjects were more likely than ALS Central subjects to participate in water activities, including swimming in lakes or rivers (OR: 31.00, 95% CI: 1.39, 691.30; p: 0.0079) and boating, sailing, or kayaking (OR: 14.00, 95% CI: 1.20, 163.00; p: 0.0329). We also found greater odds of reported pesticide exposure in ALS Eastern participants (OR: 2.33, 95% CI: 0.26, 20.66; p: 0.5784). ALS Eastern subjects were more likely to engage in several activities involving potential chemical exposures, including repairing or restoring cars, home remodeling and renovating, electrical work, and use of paint strippers or thinners. As a combined group, the ALS subjects were more likely than healthy controls to have held an occupation that involved industrial chemical exposures (OR: 6.43, 95% CI: 0.70, 59.17; p: 0.1133), as well as to have participated regularly in activities with risk for chemical exposure, such as carpentry, home remodeling and renovating, and use of paint strippers and thinners.

Conclusions: Our study has identified potential differences in exposures between ALS patients in Eastern and Central North Carolina, and more work should be done with larger sample sizes to further characterize the risks associated with these exposures.