“Examination of correlation between red tide *brevetoxin* exposure and chronic CNS effects”

THE ROSKAMP INSTITUTE RED TIDE STUDY

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The Roskamp Institute:

- Nonprofit biomedical research Institute dedicated to:
  - Understanding Central Nervous System (CNS)-related disorders
  - Pioneering new treatments for CNS conditions
- 65 Basic research Scientists and Clinicians
- Funded by NIH, MOD, VA, grants, contracts and donations
The Roskamp Institute:

- Basic clinical research studies (wide range of technologies)

- Clinical studies and trials:
  - Neurodegenerative Disorders (Alzheimer’s and other dementias)
  - Traumatic Brain Injury
  - Environmental exposures (Gulf War Illness)
  - Others

- Chronic neuro-inflammation common to all the above
  - Does brevetoxin cause CNS inflammation?
  - Are older brains more vulnerable to brevetoxin exposure?
Longitudinal Red Tide Study:

- Pilot study began June 2019
- Full study began May 2020, funded by the National Institute of Environmental Health Sciences (NIEHS)

Goal: examination of the relationship of brevetoxin exposure to short- and long-term neurological signs and symptoms

In collaboration with:

- Dr. Barbara Kirkpatrick, Gulf of Mexico Coastal Ocean Observing System
- Dr. Richard Pierce, Mote Marine
- Dr. Lorraine C. Backer, the Center for Disease Control
Neurotoxin Ingestion: Neurotoxic shellfish poisoning (NSP) causes acute neurological symptoms –

- headaches, dysesthesia/distal paresthesias, ataxia, slurred speech, dizziness, loss of consciousness, convulsions, and progression to partial paralysis.

Neurotoxin Inhalation: More chronic development of generally less severe neurological symptoms.

- A study of emergency departments reported an increase in primary neurological diagnoses in residents of the Gulf Coast during the Florida red tide blooms between 2005-2009.
- Commonest symptom headache/migraine
Objectives of the study:

- Correlations between toxin levels and CNS effects?
- Correlations between toxin-related immune responses and CNS effects?
- Correlations both during and outside of red tide blooms?
  - Do *brevetoxin* antibody titers correlate with neurological complaints?
  - Do *brevetoxin* T- & B-cell reactivities correlate with neurological complaints?
Study Design:

*Projected bloom time frames based on historical data provided by the FWRI.
Methods:

- A 2-year longitudinal study
  - Inclusion criteria: 18+ years, willing to complete health survey and donate blood/urine at study visits
- 210 (400) Volunteers will be assessed during and outside of Red Tide blooms.
- Estimation of exposure to aerosolized brevetoxin:
  - Estimated individually based on time in residential/work zones calculated from wind speed and direction (Cheng, et al. 2005).
- Biofluid assessment: quantification of brevetoxin and antibodies in blood by ELISA
Progress to date:

- Recruited: 146 participants, with complete health surveys and biosamples
- Number of repeat visits: 28 participants
- Baseline symptom analysis
- Initial antibody results
### Table 2: Demographics of Manasota residents (n=146).

<table>
<thead>
<tr>
<th>Category</th>
<th>Mean (SD)</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>61.48 (14.62)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>87 (59.6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>59 (40.4%)</td>
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</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Not stated</td>
<td>4 (2.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian</td>
<td>1 (0.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>0 (0%)</td>
<td></td>
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</tr>
<tr>
<td>Pacific Islander</td>
<td>0 (0%)</td>
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</tr>
<tr>
<td>Black/African American</td>
<td>2 (1.4%)</td>
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</tr>
<tr>
<td>White/Caucasian</td>
<td>139 (95.2%)</td>
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<tr>
<td><strong>Ethnicity</strong></td>
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<tr>
<td>Not stated</td>
<td>10 (6.8%)</td>
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</tr>
<tr>
<td>Hispanic</td>
<td>5 (3.4%)</td>
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<td></td>
</tr>
<tr>
<td>Non-Hispanic</td>
<td>131 (89.7%)</td>
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</table>
Baseline symptom (prior 30 days) reporting by Manasota residents:
Anti-brevetoxin antibodies:
Summary:

1. Examination of acute and chronic neurological signs and symptoms with brevetoxin exposure in a Manasota cohort
2. 210 participants, longitudinal design
3. High recruitment rate (400 planned)
4. Baseline differences in immune biomarkers of brevetoxin exposure
5. Opportunities to examine repeat and novel challenge of brevetoxin in study cohort
Any Questions?

▶ If you want to learn more about this and other clinical research studies at the Roskamp Institute, please call Megan Parks at (941) 256-8018 ext. 3008.