Harmful algal blooms (HABs) have been a rising health and environmental concern in the United States, particularly in South Florida. Skin contact and ingestion of contaminated water or toxin-accumulated fish had been proved to have severe direct toxicity to human body. However, the impact of aerosolized cyanobacteria HABs is poorly understood if they can form inhalable toxic particles that would constitute a more direct exposure route than ingestion and skin contact. This project is purposed to study the toxicity of aerosolized HABs using Drosophila melanogaster as an animal model. A water bubbling apparatus was designed and three age groups of flies were exposed to three water sources. After 2 hours of exposure, the negative geotaxis assay and lifespan assay have been performed to analyze impact of HABs on locomotor functions and longevity. Additionally, an immunofluorescence imaging-based brain analysis has been examined to study the impact on Drosophila brain morphological change. Young groups were more sensitive in long term response; whereas mid-age groups and elderly males showed a strong acute response to HAB exposure, suggesting age is an important role in studying impact of aerosol HABs on locomotor functions. Exposure of HABs particularly at young groups significantly reduced their longevity. Juniors and elderly females are more likely to have neurodegenerative diseases after exposure to aerosol HABs. In conclusion, results suggest aerosolized particles from HABs cause a significant health risk, both immediately after exposure and in long-term response.

**ABSTRACT**

**METHOD**

Three age groups of flies (2-day “young”, 5-10days “middle age”, and 20-30days “old”) were exposed to three water sources (H2O, 1635-2 HAB water, and 1658-1 HAB water). The groups exposed to H2O were used as control.

A water bubbling apparatus was designed where a controlled flow of air was bubbled through water phase and outflowed to a screened cage containing flies.

After 2 hours exposure, the vitality of the flies was determined by negative geotaxis assay, where the percent of flies climb above 8 cm height in 10 seconds was measured.

The lifespan was graphed to analyze the impact on longevity.

Additionally, brain dissection was performed. Brain size and BRP fluorescence intensity were analyzed to study the impact of aerosol HABs on brain morphology.

**BRAIN MORPHOLOGY**

Exposure to inhalable HABs at an early age may lead to an increased risk of neurodegenerative diseases. Elderly females are more likely to have neurodegenerative diseases than elderly males.

**CONCLUSION**

- Exposure to harmful algal blooms impairs locomotor functions, shortens the life span, and causes Drosophila synapex dysfunction.
- Aerosolized particles from harmful algal blooms pose significant health risk, both immediately after exposure and long-term.
- The fruit fly Drosophila melanogaster is an ideal in vivo animal model to analyze acute and chronic impact on health.

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**LIFESPAN**

Aerosolized 1658-1 HAB water exposure particularly and significantly shortened lifespan of the young groups for both sexes. Exposure of HABs at an early age has the most impact on their longevity.

**CLIMBING PERFORMANCE**

After one day exposure, the climbing performance in middle age and old age groups exposed to 1658-1 was significantly lower than those exposed to 1635-2 and H2O.