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Link found between 'algal blooms' and liver disease

Cyanobacteria — often referred to as blue-green algae — are found in water bodies around the world and can produce toxins with potential health risks. This US-wide study found a significant positive association between cyanobacterial bloom coverage and death by non-alcoholic liver disease. The researchers say their study suggests some evidence of a potential health risk and should be used to generate further investigation into the health impact of cyanobacteria.

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Cyanobacteria are natural components of marine and freshwater environments and perform roles vital for the health of the ecosystem. However, when the conditions are right, they can multiply rapidly to form dense surface scums called blooms. These blooms, which appear as a green blanket covering the surface of the water, produce dangerous toxins which can be harmful to humans.

By contaminating water used for drinking and recreation, these toxins can be ingested and inhaled by people. This problem looks set to increase in the future, as eutrophication and climate change encourages the proliferation of cyanobacterial blooms.

This study specifically investigated cyanobacterial blooms and liver damage, for which there is already evidence of a connection. To investigate the risk further, this US-wide study tested the hypothesis that contamination by cyanobacterial blooms is a risk factor for non-alcoholic liver disease. This is the most common liver disorder in Western industrialised countries[1], estimated to affect 20–30% of the population, and also increases the risk of liver cancer.

The researchers started by estimating the spatial distribution of cyanobacterial blooms in the US. Bloom coverage maps were developed based on 2005 images obtained by the Medium Resolution Imaging Spectrometer onboard the European Space Agency Environmental Satellite.

The maps were based on phycocyanin levels determined by the satellite, a pigment found at high concentrations in cyanobacterial blooms and which can be used to infer levels of toxins.

After producing the coverage maps, the researchers calculated mortality rates from non-alcoholic liver disease at the county level, for 1999–2010, using Multiple Cause of Death data. A statistical tool was then used to identify clusters of death from non-alcoholic liver disease, which were compared to the bloom coverage maps.

The initial results showed that cyanobacterial blooms were widespread in the US. Overall, 1949 of the 3109 counties studied (62%) showed signs of cyanobacterial blooms, which were present in the majority of large lakes and coastal areas.

Overall 773 828 non-alcoholic liver disease deaths were reported in the US from 1999–2010. Further analysis showed that bloom coverage was significantly related to risk of death from non-alcoholic liver disease. The researchers calculated that for every 1% increase in cyanobacterial bloom coverage, the risk from non-alcoholic liver disease death increased by 0.3%. If bloom coverage per county in the US increased by 1%, it would result in 440 additional deaths per year.

Although this study found a clear and significant association between the spatial distribution of cyanobacterial blooms and death from non-alcoholic liver disease, the researchers emphasise that their study shows correlation not causation. Therefore, they recommend that their findings should be interpreted with caution and used to generate hypotheses for further testing to establish the connection, and in particular any underlying biological mechanisms.

1 Preiss D, Sattar N. Non-alcoholic fatty liver disease: an overview of prevalence, diagnosis, pathogenesis and treatment considerations. *Clin Sci.* 2008;115(5–6):141–50.