Helping People Understand the Health Risks of Harmful Algal Blooms

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A new research project from the Harmful Algal Bloom Research Initiative (https://ohioseagrant.osu.edu/research/collaborations/habs) recently took big steps to help both Ohio residents and healthcare providers better understand the health risks of blooms.

Harmful algal blooms (HABs) in Lake Erie and other water bodies have the ability to produce toxins that could contaminate air, via aerosolized water droplets, and drinking water, posing a growing public health risk. Prior to this project, many healthcare providers and community members were unfamiliar with the potential health implications of HAB exposure.

In response, a team of researchers led by Drs. David Kennedy (https://www.utoledo.edu/med/research/kennedy/) and Steven Haller



Using surveys and focus group discussions with medical students, residents, and practicing doctors, the team worked to better understand people's awareness of harmful algal bloom health risks.

(https://www.utoledo.edu/med/depts/medicine/cardiology/pubs/haller.html) of The University of Toledo aimed to bridge this gap by generating evidence-based insights and translating their findings into practical education for healthcare professionals and the public. Their goal was to learn who might get sick from HAB toxins, why it happens, and how to prevent or treat it – then share this knowledge widely to health professionals wanting this information.

To tackle these questions, the team combined data analysis with on-the-ground clinical insights and educational outreach. Researchers leveraged large-scale health datasets, including a database of U.S. emergency room visits and global biomedical gene expression databases, to identify patterns in HAB-related illnesses.

"Harmful algal blooms sit at the intersection of environmental health and clinical medicine," said Kennedy. "What has been particularly important for us is identifying who may be most vulnerable, including people with underlying respiratory disease, and then translating that science into practical guidance that patients and healthcare providers can actually use."

The research yielded several important findings about HAB-related health risks. Large-scale analysis confirmed that respiratory exposure to algal toxins is a real concern — many patients reported breathing problems after bloom exposure, and a striking number were smokers. Together with the gene database analysis, this suggests that people with lung conditions are at a greater risk of elevated effects from algal toxins.

The team identified other potential susceptibility factors, such as diabetes for liver effects, that had not been well recognized before. Researchers also uncovered a biological explanation for these risk factors: chronic lung inflammation may increase the expression of toxin transporter proteins in the lungs, essentially creating a bigger "welcome mat" for microcystin toxins.

In gathering real-world clinical evidence, Kennedy and Haller compiled a series of challenging patient cases involving suspected HAB toxin illnesses in northwest Ohio. The team documented how these patients presented and were diagnosed and managed, then shared these lessons with the broader medical community. This resulted in a peer-reviewed publication that is one of the largest case studies on human HAB exposures to date.

By documenting clinical cases and publishing them, these researchers have been able to disseminate evidence-based guidelines on HAB illness. For example, the case study gives other doctors reference points on what toxin exposure looks like in children, how to differentiate it from more common illnesses, and what steps to take. This is a building block for future official guidelines on HAB exposure management.

These findings not only advanced scientific knowledge but also informed the educational materials and interventions the team produced for the project. Researchers used surveys and focus group discussions with medical students, residents, and practicing doctors to fully understand that many providers lack awareness of HAB health risks or feel ill-equipped to address them.

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— Steven Haller

Additionally, they also discovered that HAB exposure incidents that are reported at urgent cares may be underreported.

To help overcome these barriers, the team developed a suite of educational tools and programs tailored to healthcare providers’ needs as well as resources for the public. Materials included educational videos, a podcast, medical curriculum modules, health policy templates, and public health briefings. These solutions were designed to be accessible, engaging, and directly relevant to clinical practice.

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