Tumor Promotional and Immunological Mechanisms of Cyanobacterial Metabolites and Interactions with Pharmaceutical Wastes That Contaminate Water Resources

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Project Abstract
Toxins produced from cyanobacterial blooms have long been known to contribute to acute toxic effects on mammals, including humans, such as gastroenteritis, liver damage and neurological dysfunction. More recently, cyanobacterial toxins have been associated with liver cancer, but the molecular mechanisms that may be involved are not known. We propose to determine potential underlying mechanisms that may contribute to the carcinogenic potential of these toxins either directly through altered cell communication systems in the target cells of hepatocellular cancers, or indirectly through immunomodulation/inflammatory responses in relevant liver cell types that can contribute to liver cancer via compensatory mechanisms. Cyanobacterial extracts will be fractionated and tested to determine where toxicity resides. Considering that environmental contaminants typically exist as mixtures and can potentially synergize with each other, we will also look at interactions of cyanobacterial toxins with another emerging class of compounds contaminating our aquatic systems, namely pharmaceutical wastes. Pharmaceutical to be studied will include acetaminophen, Viagra and valproic acid, dependent on time this list can be expanded. A common route of human exposure to cyanobacterial toxins in developed countries are from ingested waters treated with chlorination and ozone disinfection systems, thus we will also determine if ozonation and chlorination alters the toxicity of cyanobacterial contaminants to be either more or less toxic. The interdisciplinary needs of this project require expertise in cancer cell biology, immunology/inflammation, environmental chemistry and toxicology, molecular toxicology, and environmental engineering. The team of investigators all has experience in one or more of these areas.