Intersection of water quality, human health, and aquatic ecosystems

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Flesh-eating bacteria in New Jersey reveal one possible effect of climate change, study says

By Susan Scutti, CNN

Updated 11:49 AM ET, Tue June 18, 2019

Climate Change May Be Spreading Flesh-Eating Bacteria to Unexpected Waters

More Flesh-Eating Bacteria Cases in the Gulf of Mexico and Elsewhere Are Likely Because of Climate Change

By Ron Brackett - July 30 2019 07:14 AM EDT - weather.com
Key Topics

• Global change factors affecting water quality
• Recreational Contact
• Harmful Algal Blooms
• Opportunistic Pathogens (*Vibrio*)
• Next Steps
Change Factors

Increased temperature, sea level, and storm intensity means surface and coastal ground waters are getting:

• Warmer
• Saltier
• Reduced ice cover
• More runoff and connection to coastal infrastructure
Recreational Contact

Traditional focus on fecal pathogens resulting from sewage contamination:

- Recreational contact and shellfish harvesting
- Many bacterial, protist, and viral pathogens: *Salmonella, Campylobacter, Giardia, Norovirus*
- 2018 U.S. estimate: 90M illnesses costing ~$3B annually\(^{(1)}\)
Recreational Contact

Under climate change:

- Survival of fecal pathogens and indicators *generally* decreases in warmer temperatures and salinity
- However, more intense storms and flooding (plus population growth and aging infrastructure) may increase release of sewage into surface waters

Fig. 3. *E. coli* inactivation in sediments. • – sediment A, ■ – sediment B, ▲ – sediment C. Error bars show standard deviations computed for logarithms of concentrations.

*credit: Grazio-Hadzick et al. 2010*
Harmful Algal Blooms (HABs)

Excessive growth of native cyanobacteria or algae:

- *Microcystis, Pfiesteria, Karenia, Pseudo-nitzschia*
- Produce toxins that contaminate drinking water, shellfish, and coastal aerosols
- Many toxins with symptoms similar to flu, foodborne illness
- Human health impacts poorly understood due to lack of data

credit: European Space Agency via Huisman et al. 2018(1)
Harmful Algal Blooms (HABs)

HABs are natural but increasing\(^{(4)}\):

- Driven mainly by nutrient inputs and warming
- Nutrient inputs driven by land use and changing precipitation
- Mean number of HAB days projected to increase \(\sim 3-5X\) by 2090
- Illness can be reported through OHHABS\(^{(5)}\)

\(^{(4)}\) credit: Chapra et al. 2017
Opportunistic Pathogens

Many native aquatic microbes are opportunistic pathogens:

- *Legionella, Mycobacterium, Naegleria*
- *Vibrio* including *cholerae, parahaemolyticus, vulnificus*
- Infection via shellfish ingestion and open wound contact
- Historically considered in Gulf of Mexico but recent Mid-Atlantic infections indicate spread
Vibrio expansion

Spread of *Vibrio* to higher latitudes is theorized to be allowed by warmer waters

- Historical data indicate increasing concentrations post-WWII in North Atlantic\(^7\)
- Expected to be problematic on the East coast
- Models attempt to match risk projections with observed illness\(^8\)
Possible Next Steps

• Consider recent patient contact with water bodies

• Educate physicians about illnesses and symptoms related to these issues that they may not currently suspect

• Consider contributing to and engaging with health monitoring efforts as an organized group
References


5. One Health Harmful Algal Bloom System: https://www.cdc.gov/habs/ohhabs.html

