AQUATIC ECOSYSTEMS: Climate Change, Infectious Microbes, and Human Health
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GEH Global Environmental Health Chat
Ecosystem Services: Part Two Transcript

Narrator: This is the Global Environmental Health chat, the podcast that explores environmental health issues that transcend national boundaries. This podcast is produced by the National Institute of Environmental Health Sciences, part of the National Institutes of Health.

Narrator: An ecosystem is a community of living organisms that interact in the same environment. Ecosystem services are positive benefits that ecosystems provide to humans. Take oyster reefs, for example. They supply seafood and can also buffer harmful storm surges.

Narrator: This episode is the second of a two-part series exploring how disruption of sensitive ecosystems impact the unique organisms living there, as well as human health. In this episode, we speak with Geoff Scott about aquatic ecosystems. Dr. Scott is a clinical professor and chair of environmental health sciences at the University of South Carolina. With his colleague Paul Sandifer, of the College of Charleston, Dr. Scott also co-directs the NIEHS Center for the Assessment and Prediction of the Interactions of Climate Change on Oceans and Human Health.

Narrator: Aquatic ecosystems include bodies of water like rivers, lakes, and oceans, among others. They provide crucial ecosystem services, such as fish production, drinking water, and recreation. But climate change, pollution, and human land use are changing these areas in ways that not only affect the organisms living there, but also the people who depend on them.

GS: "Our center here at the University of South Carolina focuses on the health effects of climate change interactions, so both ecosystem health and human health in those interactions~~, and~~ Within aquatic systems, we're focusing on infectious microbes."

Narrator: Aquatic ecosystems can contain microbes, such as bacteria and viruses, that can cause disease in humans. One example is Vibrio bacteria, which are commonly found in saltwater ecosystems and can contaminate seafood. When humans ingest contaminated seafood, they can develop Vibriosis, an intestinal disease. Dr. Scott and colleagues study Vibrio in their labs.

GS: "In 2004 in the United States, we had about 8,000 cases of Vibrio infections, mostly from seafood. Today, we're at 80,000 cases, a tenfold order of magnitude increase in little less than 15 to 20 years."

GS: "What are the factors driving that? Well, one of the big factors is ocean temperature."

Narrator: According to Dr. Scott, changing ocean temperatures are altering the geographic range of Vibrio species.

GS: "Normally, an organism found in the Gulf of Mexico, we now find it in the Gulf of Alaska. So it's occurring over a wider area. In addition, instead of just being an organism in the warmest months of the summer, we now see an active Vibrio season instead almost from April through November, for most temperate zone regions of the US."

Narrator: Expanding the range and active season of Vibrio bacteria could result in more cases of infection, says Dr. Scott. The warming water caused by a changing climate is contributing to rising vibrio prevalence in waters that were previously too cold to support high levels of the pathogen. But there's another factor at play. Environmental pollution can increase the sheer number of the Vibrio population in a typical bloom. Dr. Scott cites a paper by Valerie Harwood, of the University of South Florida.

GS: "Harwood and her colleagues have found that a 1% increase in sewage effluent going into coastal waters will cause a 10 to as much as thousand-fold increase in the number of Vibrio bacteria in the environment."

Narrator: Sewage and other pollution that escapes into aquatic ecosystems can also contribute to algal blooms in fresh water and saltwater. Blooms occur when photosynthetic organisms like algae and cyanobacteria grow out of control. And some of those species can be harmful to animal and human health.

GS: "Oftentimes, in many coastal areas where these cyanobacteria occur, it happens to be where our drinking water sources are for many of our coastal communities. And so we have these cyanobacteria that, when they're exposed to increased nitrogen and phosphorus, they produce more toxins."

Narrator: Nitrogen and phosphorus are components of fertilizer, which can run off into nearby water bodies during storms and flooding. Depending on the level and influx of nutrients, cyanobacteria toxin production can significantly increase, Dr. Scott says. In addition, climate change effects could also lead to more toxic blooms.

GS: "When you have a higher water temperatures over a wider area, and longer periods of time, for harmful algal blooms, we think they're increasing with regularity and in periodicity, and in terms of time and space."

Narrator: Dr. Scott's team has been working on solutions to help reduce potential human exposure to infectious bacteria and harmful algal blooms in aquatic ecosystems.

GS: "What we are trying to do from a health perspective with both the Vibrio and the toxic algae, is we are developing forecast models to warn the public when these conditions may be out in the environment so that they can avoid exposure."

Narrator: For example, his team has developed an advisory system called How's the Beach, which predicts bacteria conditions along the South Atlantic coast. Colleagues are also honing a forecast for toxic algal conditions. These tools are just one approach to climate adaptation, says Dr. Scott.

Narrator: Scott also highlights another process in place to protect the public from exposure to contaminated aquatic ecosystems.

GS: "Many people probably don't know this, but every bushel of oyster harvested in the US has the shellfish tag that moves with that bushel of shellfish from harvest to consumption, cradle to grave."

GS: "And so those tags we can back regulate to where those oysters were harvested and make sure we are restricting harvest in those areas and more importantly getting to the source, if there is a man-made source of pollution that we can mitigate. If it's a natural source, then we have to put in mitigation plans and restrict harvest and monitor."

Narrator: As Dr. Scott demonstrates, reducing the impact of climate change is very difficult. Thus the development of eco-forecasts such as How's the Beach, that alert the public and helps to prevent exposure and thus reducing the public health effects of Vibrio bacteria and HABs is so important, as this help make our coastal ecosystems sustainable for the safe use by the public in the face of a changing climate.

GS: "Climate change is such a big scale issue."

GS: "We can all try to reduce things that globally contribute to the climate effect."

GS: "But we can't manage it regionally, individually in each area to fix it."

GS: "What we can do from a public health perspective and an ecosystem health perspective is put out forecast models that alert the public and notify them."

Narrator: As Dr. Scott sees it, being able to safely enjoy oysters — and all the other ecosystem services that aquatic environments provide — ultimately depends on us.

GS: "The ecosystem services that attract us to living at the coast, the fishing, the swimming, the aesthetics of walking on the beach. We have to protect those things from an ecosystem health perspective so that we can enjoy those amenities."

Narrator: The National Institute of Environmental Health Sciences funds research to better understand the health effects of climate change. You can learn more about the institute's research by visiting our website at www.niehs.nih.gov/GEH. Thanks again to Dr. Geoff Scott for joining us today. You've been listening to Environmental Health Chat, brought to you by the Global Environmental Health program at the National Institute of Environmental Health Sciences.