

Contaminants of Emerging Concern: a knotty challenge that needs unraveling

By Judy Benson



KEY TO NUMBERS & ARROWS INTO RIVER:

- | | |
|-----------------------------|---|
| 1. House/sink/shower/toilet | → Pharmaceuticals and personal care products |
| 2. Sewage treatment plant | → Treated and non-treatable effluent |
| 3. Hospital | → Pharmaceuticals and waste residues |
| 4. Agriculture | → Pesticides and fertilizers |
| 5. Livestock | → Veterinary pharmaceuticals and waste residues |
| 6. Storage tanks | → Chemicals from leaking storage tanks |
| 7. Manufacturing plant | → Industrial treated and non-treatable waste |

SUSCEPTIBLE POPULATIONS VIA INGESTION OF CONTAMINATED FOOD AND/OR WATER:

- Humans
- Aquatic plants (algae and seaweed)
- Invertebrates (shellfish, bivalves, lobster, crabs)
- Birds
- Forage, recreational, and commercial important fish
- Marine mammals
- Terrestrial animals

This image shows sources of Contaminants of Emerging Concern and various pathways into the environment. Infographic: Virge Kask

WHY BOTHER?

The world already has plenty of big environmental problems that need attention, namely climate change, consumer plastic waste, species declines and proliferating invasive species, among others. Do we really need to worry about how to untangle yet another complicated mess?

DON'T WE HAVE ENOUGH HEADACHES ALREADY?

Contaminants of emerging concern, or CECs for short, is one of those topics that can seem like just too much to deal with right now. These are the residues of medicines, personal care products, agricultural chemicals, flame retardants and a host of other commonly used chemicals increasingly found in fresh, marine and drinking water. The term CECs came into widespread use over the past two decades, as evidence mounted about the potential harmful effects of these chemicals on people and wildlife, and the wide gaps in knowledge became apparent. How much is harmful? How long do they persist in the environment? What are the pathways for exposure? What happens when these chemicals combine? What can be done?

FACED WITH SUCH A MAZE OF QUESTIONS, WHERE SHOULD WE EVEN BEGIN? SHOULD WE EVEN BOTHER TRYING?

Perhaps different questions need to be asked, ones that look beyond the present. What will the future look like if we ignore CECs? Is that the world we want to leave to the next generation?

“These are newer chemicals that often fall through the cracks between federal and state regulatory agencies,” said Sylvain De Guise, director of Connecticut Sea Grant. “There’s enough information to know they may be of concern, but not enough to regulate or ban them. The testing hasn’t kept up.”

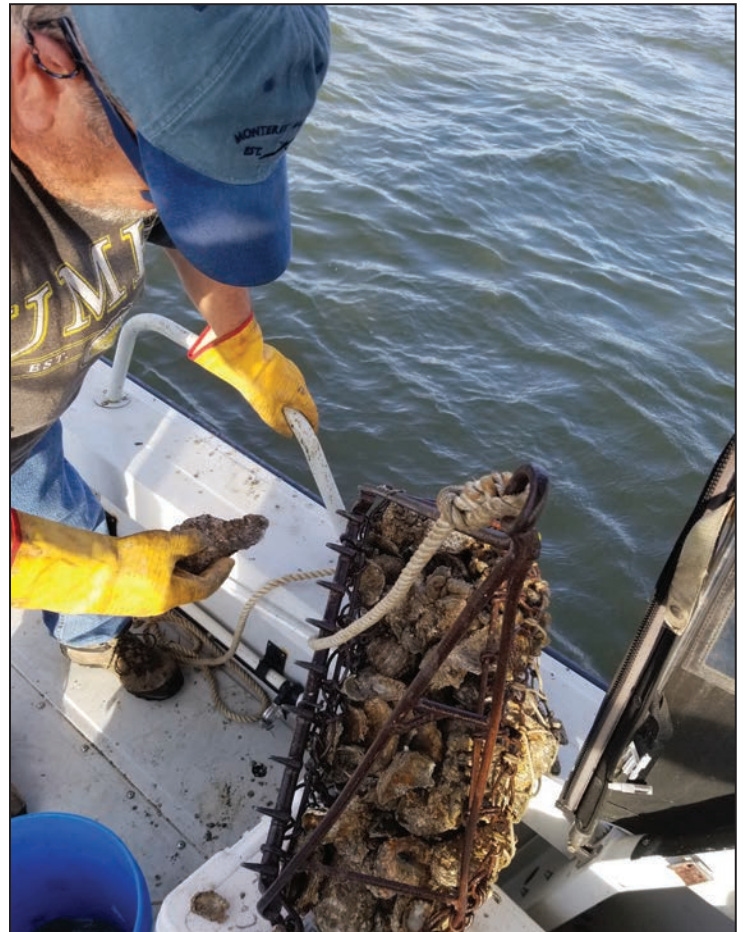
Along with his role at Sea Grant, De Guise is also a scientist who specializes in marine animal diseases, including those caused by chemical exposures. That expertise makes him ideally suited to lead the first ever national Sea Grant project, along with colleagues at the New Hampshire and North Carolina Sea Grant programs, to focus on CECs. The National Sea Grant program provided \$850,000 for the project to analyze the CECs problem and identify the role the Sea Grant network can play in advancing our understanding and reducing the risks they pose to humans and wildlife.

“Sea Grant is not going to replicate what the Environmental Protection Agency and the Food and Drug Administration are doing,” De Guise said. “But we can target research to better understand what’s happening with those chemicals on the coast and share information that will be practical” for the general public.

But before discussing the specifics of the Sea Grant project, some basic background is needed. For starters, just what are CECs?



Top, NOAA scientists and state collaborators collect blue mussels in Buzzards Bay, Mass., in 2021. Photo: Tony Williams. Below, a state collaborator collects oysters at a Mussel Watch monitoring location in Delaware Bay, N.J., in 2021. Photo: Marc Resciniti





Above, firefighting foam released by a plane crash at Bradley Airport in October 2019 flows into Rainbow Brook, a tributary of the Farmington River. Below, CT DEEP crews work to contain the foam within booms as part of the cleanup. Photos courtesy of CT DEEP.



The term encompasses a wide range of industrial and household chemicals, from flame retardants to stain protectors for upholstered furniture, prescription and over-the-counter medicines, microscopic plastic shards, pesticides and dozens of other substances used in food wrappers, non-stick pans, cleaning products and myriad modern conveniences, from cars to sunscreen. Varying amounts are found in inland and coastal waters virtually everywhere on the globe, even in the Arctic and Antarctic. As useful and beneficial as these chemicals are to daily life, their accumulation in the environment is clearly having negative effects that need to be curtailed. Research thus far points to a range of health effects on humans and wildlife. Among them, some are linked to various cancers, while others disrupt normal development and reproduction, or weaken immune systems.

Different pathways carry these chemicals into the environment. Some are released in the effluent from wastewater treatment plants that weren't designed to remove these substances. Some are carried by stormwater into waterways, and some become airborne then fall to the earth in rain and snow. Instead of just allowing them to continue accumulating unchecked, numerous federal, state and academic researchers and regulators are working to dissect different pieces of the complicated puzzle. This Sea Grant project is helping define how it can bridge the gaps between the regulators and experts, and between them and the public. It can add to the confluence of research and data to help identify on a national scale where and how to best use resources and begin to take control of what can seem like a runaway train.

"This award represents a unique opportunity to reflect and engage with partners in helping define how the talent of Sea Grant staff and its network of researchers can move the needle on a topic as broad and complex as Contaminants of Emerging Concern," De Guise said.

The project began in September 2021 by convening a team from the three Sea Grant programs and an advisory committee of outside experts. Over the next 12 months, five key steps were completed:

- A review and analysis of research literature about CECs and summary of key findings and unknowns.
- A [survey](#) that collected 646 responses to questions about how the project should be approached, chemicals of greatest concern and how environmental justice considerations should be incorporated.
- A series of virtual workshops around the country to discuss and augment survey results.
- Creation of a [national framework](#) for Sea Grant programs to follow in incorporating CECs into their responsibilities.
- A request for proposals for research projects on Contaminants of Emerging Concern focused on the Atlantic Coast.

Susan White, CECs project team member from North Carolina Sea Grant, noted that environmental justice considerations emerged as one of the main concerns of survey respondents and workshop participants. That emphasis was reflected in both the national framework and the research RFP.

“It was very eye-opening that there was so much agreement that CECs are a large environmental justice challenge,” said White, who is the executive director of North Carolina Sea Grant. “There is recognition that the burden of contamination is placed on communities with environmental justice concerns, and that that issue needs to be prioritized.”

She cited some examples: landfills located more often in poor communities; more contaminants in drinking water where older infrastructure serves underserved populations; fish that are caught in polluted urban waterways are consumed as an important source of protein for low-income families.

“We can’t wait for it to become another crisis,” she said. “That’s not going to support our communities’ health and well-being, and it’s not the best way to manage it. It’s going to be more cost effective to be in front of this than to try to mitigate it.”

Dennis Apeti, for one, is pleased that Sea Grant is making a commitment to the CECs issue. As program manager for Mussel Watch, a NOAA initiative that has been sampling oysters and mussels from 300 coastal sites since 1986, he knows first-hand how pervasive CECs are in the environment and how much more work needs to be done. Apeti also serves on the advisory committee for the CECs project.

“Any entity that can dive into assessing CECs is welcome,” he said. “There are so many things about CECs that even industry doesn’t know. Sea Grant can play a significant role in defining

a scope and working with existing organizations that do monitoring and assessment to see where they can fill in the data gaps.”

He also believes Sea Grant may be able to make important contributions to the work needed to establish toxicity thresholds for exposure levels—how much is dangerous for wildlife and people—for the most common CECs.

“EPA, USGS and the FDA are trying to define priorities for drinking water,” he said. “But we also need to set ecosystem thresholds and sediment thresholds and fish and shellfish consumption guidelines. Sea Grant can help with that.”

Apeti and De Guise concurred that Sea Grant can also help fill the need for public education about CECs and how people can take action to reduce risks from CECs to themselves, others and wildlife. Apeti noted that 40 percent of all pesticides are used in households, and much of the time people apply too much or incorrectly, unnecessarily exposing themselves and the environment.

“We don’t do enough public outreach to increase awareness and stewardship,” he said.

More public messaging is also needed to encourage people to dispose of unused medicines at public collection sites rather than flushing them down the toilet, where they’re likely to end up in waterways and ultimately in the bodies of fish, shellfish and other marine animals, De Guise said. While the CECs problem is enormous, individual decisions can make a difference.

“People need to read labels and apply and dispose of things properly,” he said. “Look for products that are biodegradable and have fewer ingredients that you can’t pronounce. We’re all part of the environment.”

For more information about the Contaminants of Emerging Concern survey and the National Framework developed for Sea Grant programs, visit: <https://seagrant.uconn.edu/research/contaminants-emerging-concern/>



Many of the pesticides sold in hardware stores and other outlets are overused or used incorrectly by consumers, unnecessarily exposing themselves, others and the environment to contaminants. Photo: Judy Benson

