Episode 6: Oil: It's what's for Dinner

<music up>

Levin: You're listening to The Loop, an audio series about the mud, microbes, and mammals in the Gulf of Mexico. I'm David Levin.

Müller: People really cannot account for all the oil that has come out of the Deepwater Horizon.

Levin: Rudi Müller is a microbiologist in Hamburg, Germany. He's trying to figure out what happened to that missing oil, and says that some of it may actually have been eaten—by bacteria, that is.

Stay tuned.

<music out>

[AMBI: Altona fish market in Hamburg—vendors shout the price of fish]

Levin: It's 7am in Hamburg, Germany, and the Altona fishmarket is packed with shoppers. Every Sunday, people crowd into the famous open air market, which stretches along the Elbe river. Shoppers haggle over mackerel. Squid. Shrimp. Giant fillets of tuna.

[AMBI: vendor and customer arguing. Fade under next line, then out]

Levin: Across town, in a lab full of humming equipment, a team of scientists is looking at their own catch of the day. But they're not interested in fish. They're focused on tinier things. Single-celled organisms like bacteria and small plants called algae.

In 2010, the Deepwater Horizon oil spill killed off countless little organisms like these in the waters of the Gulf of Mexico. Since they're at the bottom of the food chain, that had a big impact on other creatures, like fish, dolphins, and whales. And cleanup efforts made things even worse—to get rid of the oil, crews sprayed toxic chemicals called dispersants into the water.

They had nasty side effects. Tinka Murk is a researcher at Wageningen University in the Netherlands.

Murk: The unexpected problem we saw now is that it irritated the algae, and the algae produced a kind of protein that is sticky like a spider's web.

Levin: It looked kind of like snot. It stuck to the oil, mixed with sediments in the water, and sank to the bottom.

Murk: So instead of diluting the oil, you are concentrating the oil on top of the sea floor.

Levin: That may not seem like a big deal. After all – oil that sinks to the bottom can't get onto beaches and wetlands. But it can affect the ecosystem on the ocean floor. That gets hit hard.

Hollander: It's a no-win situation. You have your choice of what part of the ecosystem do you want to impact the most.

Levin: David Hollander is a geochemist from the University of South Florida. He's here in Hamburg to meet with researchers who study the spill.

Hollander: The technology for cleanup has lagged behind the technology for exploration significantly. Once the Deepwater Horizon spill happened, they were using large amounts of dispersants—essentially the identical technologies that were used in the 1970s, they were using in 2010 to clean up the oil.

Levin: So… how do you deal with that much oil? Well, it turns out, some tiny creatures in the Gulf already have a solution, and it's pretty effective. They just eat it.

Müller: There are bacteria in our environment, and you find them everywhere, that can eat oil as food. And the more food they get, the better they grow.

Levin: This is Rudi Müller, a microbiologist at the Hamburg University of Technology. He says that after the Deepwater Horizon, these species of bacteria, which live on the sea floor, had an all-you-can eat buffet. But exactly how much they ate, or how fast, is still kind of a mystery.

Müller: 17:08 there are indications that the bacteria grow down there on the oil. // but the question there is, how do bacteria behave in the deep sea, under high-pressure, low temperature conditions?

Levin: To figure that out, Müller's turning to custom-made equipment.

[AMBI up – whirring fans, lab sound]

Müller: So, here's the pressure lab…

Levin: In a plexiglass booth, Müller points to a half-dozen squat metal cylinders. They don't look like much—each one's only about a foot tall. But inside them, Müller is cranking the pressure up to more than two thousands pounds per square inch, recreating conditions at the bottom of the Gulf of Mexico. He says these devices can reveal what bacteria actually do to oil in the deep ocean. Working with them isn't always easy, though.

[AMBI: clanking sounds]

Ana Gabriela Valladares Juárez is fighting with a mess of pipes and valves that she'll use to pressurize the cylinders. She's a post-doc in Müller's lab. In one hand, she holds a pair of pliers—in the other, a big wrench.

Valladares Juárez: So now, we can open the valve… [hissing sound] oh! As you see, we have a leak…

Levin: Leaks like these aren't uncommon. Valladares Juárez says it can take hours to get a solid connection. But once the experiments are up and running, she'll be able to see how bacteria break down the oil. How fast they do it. And what conditions make it possible.

[AMBI: fade out clanking sounds]

This isn't just an academic exercise. David Hollander says studying these bacteria might lead to a new way of cleaning up oil spills.

Hollander 15:37: There's new visions for different types of dispersants which not only involve the breakdown of oil into finer particles, but the application of microorganisms that are capable of degrading the oil, so that when //the dispersants// break it into small particles, the microorganisms can attack it.

Levin: In other words, it might be possible to harness bacteria that already love to eat oil, and use them to our advantage during a spill.

Again, Rudi Müller.

Müller: There, it might be helpful, yes. As a starter to have a faster degradation in the first, say, few hours or the first day or so.

Levin: The idea is if you can put the right bacteria in the right place at the right time, you could break down the oil enough to get rid of its most poisonous ingredients – compounds like benzene and toluene.

Müller: 35:07 So there are a lot of compounds that you can degrade when you have the right bacteria. The question is can you do it reliably? Does it make sense? How much effort does it cost to do it?

Levin: To make this possible, Müller says you'd need a huge supply of oil-eating bacteria ready to go at all times, and you'd have to pump them onto the oil within a few hours of a spill.

Scientists are still a long way from making that a reality. But if they did, it could make a big difference for first responders, who get exposed to those toxins during cleanup.

For now, though, Müller and his team are focused on learning as much as they can about the bacteria themselves. Like how they behave. How they actually use the oil, and what happens to them in the process. By understanding how these organisms work, the researchers might be able to tell what role the bacteria naturally play in the aftermath of an oil spill. And someday, that might even change the way we react to those disasters.

For the Loop, I'm David Levin.

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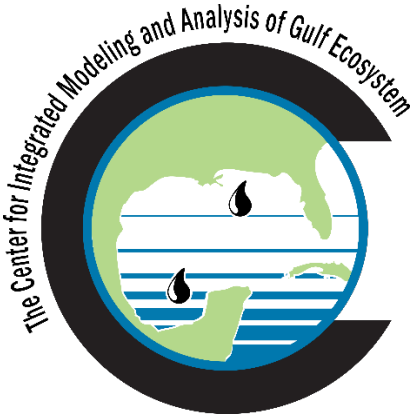


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