



After the Fact | From Lab to Life: Algae, Red Tide, and What's on Your Plate

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TRANSCRIPT

Benny Martinez, host, "After the Fact" podcast: Hey everyone. Welcome to "After the Fact." For The Pew Charitable Trusts, I'm Benny Martinez.

So, I'm going to apologize in advance here, because you might have already heard me mention that I grew up in New Mexico. I'm a child of the Southwest. I'm very proud of it. But, as you might imagine, that didn't leave me with many opportunities to visit the beach or enjoy a swim in the ocean. But that turned out to be a good thing because I've got some sort of allergy that causes me to break out in hives. It's either the sand or the salt or the sun. Por qué no los tres? Anyway, I should probably get that checked out.

I recently ignored my better judgment and joined our "After the Fact" team on a trip to San Francisco, where researchers, scientists, and local fishermen gave us a unique perspective on something called "red tide," which I learned are these toxic algal blooms—or algae—that can harm the health of humans and marine life. And not only that, its presence in our oceans can also affect the pocketbooks of people living and fishing in coastal communities.

Matthew Gribble, associate professor, University of California, San Francisco: I'm interested in how the environment shapes health for people and wildlife. And the broader area of environmental health recognizes that there's this completely inseparable connection between the people who live on the planet and the planet they live on.

Benny Martinez: That's Matthew Gribble, a researcher who studies these algal blooms through the lens of a concept called One Health.

But before we get into the science and what that actually means, we start our journey in San Francisco, where I spoke to a fisherman there named Matt Juanes, captain of Pamela J. Charters. Matt's a local fisherman with a penchant for storytelling.



Matt Juanes: My mom would always say, "So, son, like, what happens if this doesn't work?" And I was like, "I don't have a plan B."

Benny Martinez: We met Matt at Fisherman's Wharf, where he stacked 80-pound crab pots and gave us a glimpse into his day-to-day work.

Matt Juanes: Sounds good at the bar when it's, "Oh, yeah, I'm a crabber," until you had to jump in the ocean and you start thinking about National Geographic, you know, with the shark coming out.

You have to have a passion for it. It's a lifestyle. I definitely think it's a lifestyle.

I'm gonna be broke. I wanna be happy, right?

See Golden Gate Bridge right here?

Benny Martinez: Oh, in the fog here?

Matt Juanes: Yeah, right there is—just under it right now.

This is it right here. It's a million-dollar view.

Benny Martinez: Literally.

Matt Juanes: Can't you smell it?

Benny Martinez: Matt walked us through how some of the environmental challenges facing the oceans are affecting fishing communities along the coast.

Matt Juanes: We'll be fishing, and you'll see this huge rip line, just like a hard line in the water, almost like black tea.

Benny Martinez: Domoic acid is a neurotoxin produced by certain algae during harmful algal blooms. It can build up in marine life, including shellfish and crabs. And Matt explained that these blooms can shorten and delay the fishing season, adding to the other pressures already straining local fisheries.

Matt Juanes: There was two buyers here. They went out of business. So, there's only a handful of buyers here now. One's about to close. They're hanging on.



And then at that point it's like, OK, well, what's Fisherman's Wharf without fishermen? Right? It's just more T-shirts.

A lot of guys are leaving state.

Benny Martinez: They find more success elsewhere, or—?

Matt Juanes: A lot of the guys are leaving to go to Oregon, probably here in a couple weeks, for salmon. Tuna—they'll go north for tuna, albacore, just because they're closing down so much here.

Benny Martinez: If they go out, they test the crab, turns out it's too toxic, does that delay your season?

Matt Juanes: They wait another, I think, 14 days.

Benny Martinez: OK.

Matt Juanes: So, it's every 15 days I think they do.

Benny Martinez: And you're already working within a window of time.

Matt Juanes: Yes. And so then it just pushes the season back.

Traditionally, San Francisco Bay Area, California, around Thanksgiving, Christmastime, everyone wants a crab. It's just tradition to have this crab. And with all these issues with domoic acid, we don't get it.

So, like, guys up north, they're like, "Yeah, we love it. We love it when you guys don't open on time because now, we're the only ones." And their price went sky high, and they said all their crab's getting sent back down to the Bay Area, California, because we're not open yet.

Benny Martinez: So, we know that these algal blooms are affecting Matt's ability to get fish and seafood from ocean to plate. But what about the potential health effects?

We're back with Matthew Gribble, a researcher at the University of California, San Francisco, to learn a little bit more.

Matthew Gribble: I think that there's a lot of, just, fascination with the ocean that inspires a lot of what I do.



Benny Martinez: Gribble uses statistical models to study the effects of harmful algal blooms.

He's also a 2026 recipient of the Pew-Hoover Fellowship in Marine and Biomedical Science and is awarded through a crosscutting partnership between the Pew Fellows Program in Marine Conservation and the Pew Scholars Program in the Biomedical Sciences, with support from the Herbert W. Hoover Foundation.

Matthew Gribble: I grew up in Southern California in a beach town. Some of my earliest memories are at the beach. I just find a sense of peace and serenity being by the ocean.

Benny Martinez: Matthew, talk to us a little bit about where we are and how this intersects with the work that you're doing.

Matthew Gribble: Yeah. So, we are at Fisherman's Wharf in San Francisco. This is Pier 47, where they actually bring in fish.

And most of what I work on is not actually commercial fisheries, it's subsistence harvest—so, people going to the beach with their family, getting clams. So in those settings, actually going and testing is really important.

Benny Martinez: How did you find yourself working in this area?

Matthew Gribble: My first couple of marine life projects, I was being trained in statistical methods, and I was able to get my hands on datasets—like, twenty years' worth of data on contaminants and blubber of seals that had been harvested during, Alaska Native harvests.

It was an opportunity to look back and learn from this work that they had done for other purposes but gain this new insight.

And, when I was in my postdoc, there was this harmful algal bloom that extended all the way from Baja California, Mexico, up to Alaska. And it co-occurred with a warm water thing called "the blob." It was in the news. And when I reached out to the state of Alaska to see if they had data on this, they said, "Oh, we don't really have a very active program for this, but the Tribes in Southeast Alaska have just started doing some testing. You could go talk to them."

And I reached out to them and said, "Hey, I'm really interested in this *Pseudo-nitzschia* domoic acid bloom." And they said, "We're really concerned about the local problem, which is these *Alexandrium* blooms."



And so the Tribe's interest and the Tribe's scientific leadership in getting this program off the ground—I just happened to run into them right as they were getting started and was able to provide technical assistance, and that has been ten years of work together now.

Benny Martinez: So, a kitchen table issue, where people are worried about or concerned with what makes it to their plate, that's sort where your work comes in, in terms of how we're looking at the food that comes out of the ocean.

Matthew Gribble: So it's really a common practice for people to go to the beach, dig up a bunch of clams, put them in the freezer, and then send one to the Tribal lab. And then they will be able to tell them if the batch is contaminated or not.

They also do monitoring at specific locations, so they can build, like, a map of where they think is safe.

Benny Martinez: Gribble's work is deeper than just testing individual clams for unsafe levels of toxins. Later, we'll hear how he is using long-term data to develop models that could help communities all around the world.

But first—now, pay attention, class. Let's learn a little more about harmful algal blooms, or, as us normies refer to it, red tide.

Algae are a natural part of aquatic ecosystems, but some blooms can become harmful when they grow rapidly or produce toxins. Harmful algal blooms happen around the world, but the local problems vary because of the different types of algae.

Gribble and I traveled to Moss Beach. That's about 30 minutes south of San Francisco. It's a beautiful stretch of coastline, known for its rocky shoreline and tide pools that emerge at low tide. It's there where we found shellfish that can be affected by red tide.

Matthew Gribble: So, in California, we know them as the red tides. In Florida, they also call it red tide, but it's actually completely different.

Benny Martinez: So not all red tide is red?

Matthew Gribble: Not all red tide is the same algae. So, in Florida, it's a *Karenia brevis* bloom. They both can make the water look different, but they're not the same thing, and the toxins they make are not the same.



So, brevetoxins are respiratory irritants. If you're walking on the beach and you have asthma, you might have some exacerbation symptoms. In California, it's a *pseudo-nitzschia* bloom.

Benny Martinez: Is it domoic acid?

Matthew Gribble: Yeah, that's the California one.

Alfred Hitchcock's movie, "The Birds," that's based on a true story. In the real world, it was not actually murder birds, but they were disoriented and flying into stuff because domoic acid damages the hippocampus and is really disorienting.

Benny Martinez: And the list goes on. In fact, in Alaska, there is a condition called paralytic shellfish poisoning, where eating exposed clams can cause tingling and numbness. And in the worst cases, it can ultimately cause paralysis in your lungs, leading to death.

Can you play myth buster for me? 'Cause, like, for a lot of toxins, I feel like the general population immediately goes to, like, "Oh, well, can't I just cook this out of the food?"

Matthew Gribble: A lot of these toxins are pretty nefarious. They're odorless, tasteless, colorless, and not destroyed by cooking.

Benny Martinez: So it's impervious to heat.

Matthew Gribble: It depends on the thing, but yeah, for a lot of these, that's a concern.

That's not to say that food preparation techniques have no influence on it. Sometimes they can change the dose, or it can be converted to a different chemical. Sometimes they cut away a part of the animal that might have a higher concentration of the stuff, but there's also really big differences between types of clams and which kinds of clams clear the toxins faster.

So, the reason we use mussels for the monitoring programs as our main indicator, it's that you see the rise and fall of these in the environment quicker in the mussel data than you would in other data.

Benny Martinez: So the reason you use mussels, just so that I'm grasping this the right way, is that because the toxins are processed through the mussels so quickly, you know that if a mussel is testing high, it's high.



Matthew Gribble: It was recently high.

We're trying to understand how these things are changing over time in the environment. We maybe go out every two weeks, and go to the lab, and measure what was in the mussels. And then we can make a statement about, over the course of the year, what percent of the days did it seem like there was a red tide? And that lets us sort places and times from, like, this is a high-risk zone, this is a low-risk zone.

And then you could take that and plug it into studies of, do people living near the high-risk zones in the high-risk years get sick more often than people who are in the low-risk zones, low-risk years?

Benny Martinez: Gribble showed me what these mussel beds look like up close.

We had to wait until the tide was low—and then the shells of hundreds of mussels began to appear along the rocks. There were lots of kids and other beachgoers nearby who were just as excited to see what we were exploring.

Matthew Gribble: As you can see, there's a lot of mussels all clumped together on the rock. They use these for tracking toxins in the environment because they are able to pick up toxins when they are filter feeding the water.

And so, if you get them from a beach at different time points, you can see how the levels go up and down at that place over time, and that tells you something about how pollution is being released in the environment or about how blooms are occurring that are making these toxins in the environment.

Here, these mussels are not necessarily the primary food stuff, but they are part of the food chain, and they reflect it.

A sentinel species is something that we can look to, to get a picture of what's going on in the environment and give us kind of an advanced warning of if there's something that could be a concern to people.

Benny Martinez: Some coastal communities rely on seafood and shellfish as part of their everyday diets. And it raises the question of whether they have an increased risk of exposure to these toxins.

Matthew Gribble: A lot of the world's total population lives very close to the shore. And people might be exposed chronically in a way that might matter for their health differently than an acute overdose of a toxin from a single bad batch.



Alaska Native populations are not the majority population in the state, but more than half of the cases of paralytic shellfish poisoning that have been reported to the state are Alaska Native people. That may be because there's a more common practice of going to the beach and getting clams and eating them with your family.

So there's a question about health outcomes that take a long time to develop or things that matter because of when you're exposed, like during pregnancy. We don't have an evidence base in general for human populations yet for these algal blooms.

Benny Martinez: So how can you track whether small exposures over time are affecting people's health years later? Gribble walked me through the nitty gritty of his research—and it's, in part, a mapping project.

Matthew Gribble: Historically, a lot of the modeling of these algae has been based on a really deep understanding of a specific location that's been studied for decades. So, like, the Gulf of Maine. Woods Hole Oceanographic Institution is a really wonderful model for these algae there, but it requires you to have studied the place in extreme detail for a very long time with a lot of resources, and a lot of the world doesn't have that kind of historical oceanography available.

I'm hoping that this project with Pew and the Herbert W. Hoover Foundation will allow us to build maps of when and where we think the algae that make these toxins were occurring. And the tool that we're developing through this work can be repurposed for other places around the world.

This modeling approach that we're developing is a way of going back and historically estimating for people what they might have been exposed to. And that can let us sort people from less exposed to more exposed. And if more exposed people get sick more, that's pretty strong epidemiological evidence that there's a link between this exposure and this outcome.

Benny Martinez: Well, it seems like a lot of work to do. I mean, like, what keeps you going day in and day out?

Matthew Gribble: One of the things that I really enjoy about this work is the team science aspect of it. I get a lot of my data from Alaska Native Tribal partners. I benefit from California. The state just sent me their data to play with, and the data for Spain is also from their government program in Andalusia. So, these are other people who have dedicated their time to going out in the field and then going to the lab and measuring them.

Then they look at how those trends are changing over time. So that is where my skillset can plug in.



Benny Martinez: We've talked to you extensively throughout the week, and one thing you keep mentioning is One Health, planetary health, ecohealth.

Walk me through what each of those things are, how they're interconnected.

Matthew Gribble: Planetary health recognizes that we are changing the way that the planet functions, and that can have local manifestations like when and where algal blooms are occurring.

So planetary health is about the planet. Ecohealth is about the local ecosystem. One Health thinks about animals and people in the environment and how what affects animals affects people. And maybe we'll improve outcomes for both by understanding things that affect both.

Cara Field, director of conservation medicine, The Marine Mammal Center: I think one of the biggest things that keeps me going is the community that I'm so fortunate to work with.

Benny Martinez: That's Cara Field. She is the director of conservation medicine at The Marine Mammal Center. It's the largest marine mammal hospital in the entire world. And she's worked with Matthew Gribble for a few years now.

Cara Field: It becomes really critical that we understand what's driving these blooms. And how is that impacting not just the sea lions that are showing up at our doorstep, but in the ocean, how many animals are being affected? What about the whales? What about the seabirds?

Giancarlo Rulli, associate director of public relations, The Marine Mammal Center: We get upwards of 22,000 calls to our hotline every year, so it's the busiest hotline on the West Coast.

Benny Martinez: That's Giancarlo Rulli, also from The Marine Mammal Center.

Giancarlo Rulli: Right now, off of Santa Cruz County, the parts per million of *Pseudo-nitzschia*, which is the primary algae connector for domoic acid, is off the charts. Off the charts. It's among the highest rates I have seen in two decades.

Typically there is a bit of a delay of by the time that works its way up the food chain to a top predator like a sea lion.



Benny Martinez: Just a friendly reminder, we recorded this interview back in June. And Giancarlo said these higher levels will show up in the larger marine mammals right around now, when this episode airs.

Giancarlo Rulli: We're seeing these things pop up year-round, and that's been kind of a wake-up call for everyone here because we're having to adapt, you know, making sure we have enough bagged fluids, making sure we have enough anti-seizure medication in stock to deal with potentially 200 animals coming in in two months.

Through these animals, they offer us a window into the health of the ocean. What they're telling us in real time is critical to listen to and apply toward our broader understanding for our own health.

Benny Martinez: So it's not uncommon to walk the beach and find seashells, algae washed up on the shore, or even a bunch of kids building sandcastles.

But on the day we visited the tide pools at Moss Beach, we spotted something in the distance being tossed around by the crashing waves. It was white, eerily fluffy, and big. So, as we walked closer to get a better look, it became pretty clear. This was likely the remaining blubber of a decomposing whale. And a little further up the beach, our guesswork was confirmed. The skeleton of that whale had attracted a group of beach goers, marveling—just like we were—at the size of this thing.

We'll take a closer look at the work of The Marine Mammal Center—and the people protecting these animals—in a future episode.

Thanks for listening. To learn more, visit www.pew.org/afterthefact.

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For The Pew Charitable Trusts, I'm Benny Martinez, and this is "After the Fact." Until next time.