ACS AMA: Hi Reddit! I am George Cobb, Chair of the Department of Environmental Science at Baylor University. Ask me anything about environmental chemistry or exposure assessment.

AmerChemSocietyAMA [1] and r/Science AMAs[1]

[1]Affiliation not available

April 17, 2023

the WINNOWER

REDDIT

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Baylor alum here! How do you see environmental scientist's roles adapting to the need to advocate for change in government? It seems like science is often ignored, misunderstood, or denied by government officials. How can researchers do more to change this pattern?

Sspifffyman

Great question. While this is not really about Environmental Chemistry, we scientists do need to be better communicators to the public. In general the best approach to relay perspective starts with your personal contacts and local community. Too often we in the US think about national level politics. I suggest that you speak clearly and dispassionately to your friends and family about science and how that explains processes that affect us. That will provide some practice that you can draw upon to begin engaging your local policy makers either individually or as part of a group. Making statements to community governments as a citizen or as a member of a respected community group can also be very beneficial. Remember all politics is local! The most important thing is to speak the truth, not to overstate or diminish the facts/information that you are relaying. That is tough because most people want a sharp contrast on one side of "an argument" or the other.

If you're about to buy a house on what was once industrial land, what kind of soil testing would you do? Same question but for farmland?

rcb314

Good question. This would depend on the type of industry that occupied the site. Metals fabrication or plating would suggest a need for more metal (eg lead, chromium, etc) testing while other types of industries might have been more likely to have released solvent or other organic chemicals. If the industry was still in operation, curing the late 1970's or if the property was bought/sold after the industry closed, your state environmental agency should have information about that site/business closure. And yes it is always a good idea to require the seller of property to provide certification that these problems have at least been evaluated. It is always good to remember that many operations used chlorinated solvents as de-greasers even if they were not organic chemical producers. That

means testing groundwater is also a potential thing to consider.

This is more on the practical side of things: My local landfill makes compost using yard debris and food wastes. How much of the herbicides, pesticides, and other potentially harmful things will remain after the composting process? How safe would that be to use in vegetable gardens?

jstaylor01

This is a question many in the urban and suburban areas have. The good news is that by the time the waste has composted, the microbes that are degrading the food will also have degraded the toxicants that you are concerned about. Food waste is not really an issue at any point since the concentrations of contaminants will meet food quality when purchased and will not increase with composting. Yard waste can pose problems if not completely composted, but only if there is a large amount of weeds that were killed by persistent herbicides or plants that contain large quantities of systemic pesticides.

How do I convince my mother in law that the government isn't faking global warming to make her pay more taxes?

-cjo-

Well that is the $64,000 question. Just look at the historical temperature data from your local news service. She probably trusts that the "weather man" provides an accurate daily temperature, not prediction actual temp. The long term trends are undeniable. The problem in explaining in a short session is that the trends are long term and require data aggregation to be most powerful, but the local data should be good enough to start the conversation. She could also try checking out a couple of books by Katharine Hayhoe explaining climate change from a "conservative" perspective.

What does your job looks like on a daily baisis?

lemonstine001

I wish I could get to the lab and to the field more than I do. At this point, I spend most of my day discussing research projects and proposals with students, staff and colleagues, managing budgets, writing and reviewing manuscripts, charting courses of action for the Environmental Chemistry Division of ACS, working to address environmental issues with colleagues from across the globe who are part of ACS and SETAC. Recently I have been involved in an EPA review of the explosive RDX and in the consideration of registration of double stranded RNA insceticides for use in corn. I also normally teach a 3 hour class one afternoon a week. right now my group is evaluating Arsenic and copper uptake into rice and using high resolution Mass Spectrometry to characterize novel compounds in sediments.

What is it like leading a technical team in a very conservative community?

Have you discovered approaches or attitudes that do or don't work when addressing people who maybe haven't been exposed to important environmental issues, or are possibly even hostile to the science position?

Finally, does studying the adverse effects of explosives include screening Michael Bay films? :) Thanks.

roger_ranter

Good question. Technical teams are just that technical teams. The surrounding community does not impact the technical aspect of what we do. That is an important thing to always remember. We have done research in MUCH more conservative places than Waco Texas. We have found that if you talk to people about the real problems that you are tying to address and how that will benefit them and their families. The vast majority are accepting, even if that requires short term activities they do not like. Interesting example, the most conservative folks in our community are concerned at this very moment about a land fill that is proposed to be expanded into a flood plain of our lake for drinking water. You can be sure these folks are asking to discuss environmental chemistry. Pretty good way to suggest that strong environmental programs and policies would address many of these concerns. Approaches that do not work are those that imply that other people are unintelligent. Sometimes asking others what they consider the most important issue give an opportunity to address that and then expand into other areas. There is almost always a common denominator for a discussion. The key is finding it. Perhaps a practice someone leaned from a grandparent, love of fishing or camping, the backyard garden, the health and safety of their children. Truthfully relaying environmental topics through these lenses is normally very efective.

Good morning, Dr. Cobb! Baylor alum and moderator of /r/Baylor reporting in. I must confess, I know very little about environmental chemistry or exposure assessment, and my questions are going to reflect that.

- If you could ensure that the average person knew one important thing about your field, what would that be?
- What is the fastest-growing or most exciting topic in your field?
- What policies/laws should we be aware of that affect the practical application of this research, either positively or negatively?
- BONUS QUESTION: Vitek's or Coach's for bbq?

Thank you for doing this AMA!

NawtAGoodNinja

WOW. One important question... We can not understand environmental processes "in a bubble." Almost all processes are interconnected. For instance nutrient presence and availability influence the need of an organism to access additional areas to obtain nutrients, which influences energetics, which affects respiration and may influence organism health, or reproductive status. Now expand that to temperature, or light or water availability, or contaminants.

I believe that the RNA silencing pesticides represent a critically important topic. They have the potential to completely disrupt the traditional pesticide manufacturing industry and alter agricultural practices on a global scale. The merger of Monsanto and Bayer makes the importance and global relevance relatively apparent.

US Policies are adversely affecting environmental chemistry research, by eliminating the research programs of USEPA and preventing EPA from funding extramural research. This has been ongoing for quite a while, but has gotten worse this year. Also the laws that require USEPA and other regulatory agencies to make decisions in finite time intervals with available data rewards those who choose not to conduct high level environmental testing of existing products.

With wife who grew up on ranches and a mother in law who grew-up on the King Ranch, I gotta say... BBQ at home! If I specifically want to go out for BBQ, we usually head down to THE CYCLONE in Temple.

How could one explain TRI data to the layperson when the news decides that this data means a company is polluting the environment when actually they are doing their legal duty by reporting the chemistry they've used and/or properly disposed of. It seems that more and more, news outlets are targeting businesses that use chemistry as the "bad guys" when in reality, we're bending over backward to reduce our usage (the whole point of TRI as well as state-run programs) and make sure the reports are correct. How could "Right to Know" be better clarified?

Happy_Fun_Balll

Toxic Release Inventories are important in transparency with communities. Explaining the relative amount of releases that are not contained or properly disposed may be a reasonable approach. The reduction aspects that you mention are important and is one reason that ACS has a Green Chemistry Institute to help industries reduce hazardous chemical use as much as possible.

Do you think pollutants have affected human reproductive organs like they did freshwater fish before they banned DDT? Do you think there is any correlation to our social structures caused by environmental pollution?

Illtakeblondie

Well this is a difficult one. There are some correlations between reproductive organ effects and chemical use by society. Very little relating specific environmental exposures to reproductive organs in humans. There are studies relating chemical exposures to alterations in reproductive hormones.

Is there any Unbiased, trustworthy, non-politically influenced evidence pointing to the adverse effect of hunters' use of lead ammunition on the health of wildlife?

I'd be interested in any historical information dating back to the banning of lead shot on migratory birds at a federal level, California Condor zone research, or other areas of focus.

In this unfortunate political climate, we hunters are in a tough spot when determining whether either side of the argument is actually telling us the truth.

Thats_my_cornbread

Yes there is. First of all, some of my closest colleagues are avid hunters and they use steel shot. One of them commented recently that the improvements in gun powder has made the arguements about need for lead over steel pretty much obsolete. The adverse impact on waterfowl is pretty clear. There is lots of information in the report: A Review and Assessment of Spent Lead Ammunition and Its Exposure and Effects to Scavenging Birds in the United States. You might also try getting a copy of An ecological risk assessment of lead shot exposure in non-waterfowl avian species: Upland game birds and raptors. Hope this helps.

Hi Professor! Two Questions:

First, what made you decide to focus on exposure assessment? It seems like something you've dedicated a good portion of your life to studying!

Second, what's the process for taking technical conclusions and turning them into risk assssments or recommendations?

Go Frogs ;)

Serious_Senator

Interesting question. I had an excellent undergraduate advisor, Frank Kinard at the College of Charleston, who advised many of us that new chemical products required year to develop, but it often took decades to address the enviornmental properties that we did not fully understand or the unintentional by-products. I ended up in exposure assessment as a way to apply my environmental chemistry knowledge to help protect people, flora, and fauna.

Exposure assessments are part of risk assessments. The paradigms require that the problem be formulated first and that needed data be identified. When exposures are adequately assessed they are merged with effects/response assessments to determine the likelihood that exposures to toxicants occur at concentrations that reach toxic thresholds. These are normally probabilities that an exposure will exceed some toxic threshold (normally for ecological assessments) or the probability that a cumulative exposure will cause an specific adverse effect (more so for human assessments, although some very sophisticated ecological assessments can use this approach as well). The problem then becomes turning the scientifically based risk assessment into a policy decision, that uses many factors that are not necessarily based on science, but rather on values.

What made you want to go into this field of science, or be a scientist in general?

What advice would you give to those who want to become a scientist?

And are there any benefits to studying environment chemistry? And why?

Nova_the_Magus

I always loved science and had great teachers from Elementary School through College. Very lucky that way! My research advisor in college and in graduate school shaped my career towards environmental chemistry. If you want to become a scientist, never forget, the Latin root means knowledge. Not hypothesis testing or methodology. Those are tools to the end goal of knowledge. We scientists are pursuing knowledge. With that in mind try to use even common activities to improve knowledge by asking basic questions about processes or reasons that things happen/proceed in a certain way. You should also learn as much mathematics (including statistics) as you can. The benefits of studying environmental chemistry are that you integrate biological and physical sciences together to explain processes that control things we depend upon for enjoyment (weathered mountain ranges, clean oceans/rivers), comfort (cotton, wood, fuel availability) our very lives (food, air, water).

I recently learned that my area has a track record if radioactive pollution. My biggest concern was an incident with cobalt 60 in the town next to mine. If you guessed this is in New Jersey, you're spot on. In addition to this, there are countless defunct iron mines in the area that have not properly been capped over, so I'm wary of what other corners may have been cut. What are the risks of these pollutants on us? Does the ground water or anything else pose a risk to children or others in the area?

daydreamradio

Yes, Cobalt-60 is not something to be taken lightly. It is very toxic and often bioavailable. If there is any good news it is that the half life of Co60 is 5.3 years, which means that 40 years after its production only 0.4% of that isotope will remain. Not sure when the last production was in your area. Also, the iron mine could be leaching acid, which makes metals more soluble in water. This type of water is what was released in Silverton, CO in 2015. As with all mines the ore being mined always has impurities or co-deposited minerals that may contain toxics. Thus acid leaching can be quite a problem.

Does anything get mercury out of the environment, or does it remain forever?

DiggSucksNow

Mercury can be sequestered in sulfide type minerals, but elements such as mercury are pretty much here to stay (slow nuclear decay aside, which is negligible for naturally occurring mercury)

What is the long term effects of pesticide exposure to humans? I am more curious about a few random doses that are enough to make you sick, not long term systemic dosing.

BubblegumAndEvil

First of all there is really no good reason to have acute random doses of pesticides that are sufficient to to cause immediate adverse effects. Most risks are cumulative, although a few can manifest after a single exposure. That would simply be mis-use. Most current use insecticides impair neuron function, and as such, have the potential to cause degenerative effects with prolonged exposures, but this is not from a few random high intensity exposures.

I heard that thermal receipt paper leeches dioxins into the skin. It mimics estrogen and causes cancer. Why aren't people more concerned about dioxins in general? Is there a bigger stealth threat to human health than dioxins?

gistya

The chemical in thermal paper is indeed bisphenol a (BPA). The good news is a major manufacturer in Europe and now in the USA use different technologies now that have eliminated the use of BPA. There may be more specific information at the ACS Green Chemistry Institute site about the technology and vendors.

anabolic steroid aerosols from animal feeding operations explosives

Could you talk about that a bit, and share some of your concerns? This sounds... troubling.

RedDragonJ

Well there was supposed to be a comma between operations and explosives. So these are separate topics. Anabolic steroids come from excretion of androgens and estrogens that cattle receive as implants when in feeding operations (not in the pastures, but in large feed yards). After excretion these steroids are released primarily associated with particulate matter, which is transported downwind of feeding operations in measurable and environmentally relevant concentrations.

anabolic steroid aerosols from animal feeding operations explosives

First I've heard of this. Could you explain what animal feeding operations explosives are? Is this a method of quickly delivering anabolic steroids to large groups of animals, or is it accidental explosions? And finally what effect do these aerosolized steroids on the surrounding environment?

CurlyHairedFuk

please see my comment above. there was supposed to be a comma between operations and explosives

I recently heard it argued that most studies on Roundup are actually focused on just glyphosate without any of the adjuvants that *actually* make up a commercial formulation. Studies that included these adjuvants have shown much greater toxicity.

Any truth to this?

Do you eat organic?

occamsracer

There are a range of study designs in the literature addressing Round-up and it's active ingredient glyphosate toxicity. Many of the studies do in fact use glyphosate alone. Others use the formulated product. The toxicity inherent from the adjuvants is most pronounced for aquatic invertebrates. The reason for this is that adjuvents for Round-up are primarily detergent like compounds that disrupt/soften the exoskeletons of most invertebrates. So in essence the toxicity is from the weakening of the exoskeleton not from the glyphosate, itself.