

# Science AMA Series: We are the Society of Environmental Toxicology and Chemistry (SETAC): Ask us anything about environmental toxicology and chemistry!

SETAC<sub>NorthAmerica</sub><sup>1</sup> and *ScienceAMAs*<sup>1</sup>

<sup>1</sup>Affiliation not available

April 17, 2023

## Abstract

The Society of Environmental Toxicology and Chemistry (SETAC) is hosting the 36th North America annual meeting this week and has asked experts from across academia, government and industry to answer questions on a wide array of environmental issues. We will have experts across a wide range of environmental science topics, including neonicotinoids (pesticides) and bees (pollinators), risk assessment, microplastics, nanotechnology, personal care products and pharmaceuticals (in the environment), endocrine disruptors, metals in the environment, environmental disasters (such as oil spills), and many more. If you have questions about chemicals or toxicants in the environment – we'll try to get you the best possible answers according to the latest science. Please do note that we are asking members of the society who represent researchers from a variety of disciplines and sectors; the answers are not official SETAC positions. We encourage discussion and debate! Just please keep it professional. For more information on SETAC see <http://www.setac.org> Post your question and the organizers of the conference will find someone to answer it as soon as possible. Answers to questions will begin at 1PM EST (6 PM UTC, 10 AM PST) and continue throughout the day until 9 PM EST (1AM UTC, 5 PM PST), with a few breaks.

[REDDIT](#)

# Science AMA Series: We are the Society of Environmental Toxicology and Chemistry (SETAC): Ask us anything about environmental toxicology and chemistry!

SETAC\_NORTH\_AMERICA [R/SCIENCE](#)

## ABSTRACT

The Society of Environmental Toxicology and Chemistry (SETAC) is hosting the 36th North America annual meeting this week and has asked experts from across academia, government and industry to answer questions on a wide array of environmental issues. We will have experts across a wide range of environmental science topics, including neonicotinoids (pesticides) and bees (pollinators), risk assessment, microplastics, nanotechnology, personal care products and pharmaceuticals (in the environment), endocrine disruptors, metals in the environment, environmental disasters (such as oil spills), and many more. If you have questions about chemicals or toxicants in the environment – we'll try to get you the best possible answers according to the latest science. Please do note that we are asking members of the society who represent researchers from a variety of disciplines and sectors; the answers are not official SETAC positions. We encourage discussion and debate! Just please keep it professional.

For more information on SETAC see <http://www.setac.org>

Post your question and the organizers of the conference will find someone to answer it as soon as possible. Answers to questions will begin at 1PM EST (6 PM UTC, 10 AM PST) and continue throughout the day until 9 PM EST (1AM UTC, 5 PM PST), with a few breaks.

---

[READ REVIEWS](#)

[WRITE A REVIEW](#)

## CORRESPONDENCE:

DATE RECEIVED:  
November 03, 2015

DOI:  
10.15200/winn.144646.64812

ARCHIVED:  
November 02, 2015

CITATION:  
SETAC\_North\_America ,  
r/Science , Science AMA  
Series: We are the Society of  
Environmental Toxicology and  
Chemistry (SETAC): Ask us  
anything about environmental  
toxicology and chemistry!, *The  
Winnower* 2:e144646.64812 ,  
2015 , DOI:  
[10.15200/winn.144646.64812](http://dx.doi.org/10.15200/winn.144646.64812)

Thanks for doing this AMA - science is awesome!

What are some of the worst chemicals/toxins that the average person puts into the environment on a day to day basis? Which ones are avoidable, and how?

[positive\\_electron42](#)

Typical chemicals/pollutants that an individual puts into the environment are: personal care products which often contain microplastics in the form of microbeads that are used as exfoliants as well as the medications that are in shampoos, body washes, skin care and such. Pharmaceuticals in general can be a problem - if you swallow it you will eventually flush it and much of it ends up in streams because they are not removed by wastewater treatment processes. Finally the pesticides and fertilizers used in the yard, if not applied properly, can wash into storm sewers. Most water in storm sewers is not treated before it goes into a stream.

Thanks for doing this AMA - science is awesome!

What are some of the worst chemicals/toxins that the average person puts into the environment on a

© et al. This article is distributed under the terms of the [Creative Commons Attribution 4.0 International License](#), which permits unrestricted use, distribution, and redistribution in any medium, provided that the original author and source are credited.



day to day basis? Which ones are avoidable, and how?

[positive\\_electron42](#)

you might think the answer would be pesticides but there is so much regulation to ensure that the pesticide used as the label states should not harm humans or the environment.

Where do you see fracking in regard to its environmental influences and how dangerous is it really for the drinking water in the respective areas?

[Micaruba](#)

The main danger as I see it regarding drinking water exposure to fracking chemicals are: 1) spills or releases of frac fluids on the surface which could infiltrate into groundwater are the most common exposure risk, 2) even though frac wells for unconventional oil and gas deposits are often 1000s feet below groundwater aquifers, well casing failures could allow transport of frac fluids and volatile organics to travel into groundwater aquifers located closer to surface. Side note: Local air quality problems could be the bigger problem when compared to groundwater/drinking water risk.

What's the most dangerous compound that most people use on a daily basis that we're unaware of?

[eskimoexplosion](#)

Because humans differ so much by environment, diet, lifestyle, etc. this would probably be very dependent on the individual. There are chemicals in many different things, from household cleaning products to foods to chemicals in the air, that could potentially be toxic. The chemical that would be most dangerous to a particular person would be one that is highly toxic, and also that the person has a high exposure to. This translates into a high risk for that person for that specific compound. For example, the answer to this question for a smoker would likely be the contents of tobacco, while for a person in an underdeveloped country might have a higher exposure to unregulated workplace poisons. Many chemicals require continued exposure for them to cause adverse effects.

about how many chemicals were people exposed to on a daily basis in 1750? About how many today? Has anyone produced a graph showing the starting date, and growth of human exposure to chemicals in the environment? (food additives, fragrances, agri chems, etc.

[cosmotravella](#)

Great question! If we simplify the question a bit, the number of known chemicals that were carcinogenic prior to 1900 were only 4. Soot was one (containing polycyclic aromatic hydrocarbons). The problem is that around the 1930 (just before World War 2) the era of organic synthesis mushroomed, so that tens of thousands of chemicals have been synthesized since. Furthermore, the chemicals are often biotransformable, meaning that they are converted into slightly different forms, known as metabolites. In some cases, the metabolites are toxic whereas the parent compound isn't. So the answer is that your question is much more complicated than you probably envisioned. Look at the popular literature, like Silent Spring (Rachel Carson) or Our Stolen Future (Theo Colborn) as those books might help.

I've been accepted into an Environmental Toxicology Masters level program.

Can I hear some stories about the career paths of scientists involved?

Do any of you have any thoughts on VOC PCB remediation?

[tw\\_4\\_a\\_rainy\\_day](#)

Most importantly, don't think too narrowly about the application of your degree. Beyond the traditional ideas of being a lab/field scientist, teaching, becoming a consultant, etc., think also about the application the science communication. We need people with science expertise that can explain science to the public, decision makers, media, legislatures and that can bring diverse science disciplines together to talk to each other to solve problems.

Hi and thanks for doing such an important AMA!

As someone who is very interested in the process of cleaning up our waters but with little science background your work has great interest to me and I was hoping you could answer or touch on some questions that I have had but unable to find detailed answers for.

Why is it so difficult to separate toxins, chemicals, and metals from water ways?

What could someone do to clean up the waters of places like India and China if all the garbage was removed? Is there an effective and somewhat cost effective way to remove the toxins to make the water potable?

If money was no object, what is one thing you would do to help our waters?

[RecoilS14](#)

Water dissolves inorganic materials and so metals and other compounds have natural levels that occur in water. Drinking water systems measure the levels of metals and other chemicals in the drinking water supply and compare the values to "safe" criteria.

Fro China and India, they need to develop a sewage treatment plant system to treat sewage before it enters their waterways. Raw sewage, garbage, etc. cause many of their health problems.

No \$\$ issues: For the US, control nutrient levels and maintain habitat would be starters. Water supplies in the West are issues too.

For India, etc - sewage treatment plants, effluent controls on industry wastes, and habitat issues would be on the list.

In regards to the neonicotinoids. How exactly are the neonicotinoids declining bee populations? In a few studies I read neonicotinoids lowered the bees immune system making them more susceptible to infections and diseases caused by the varroa destructor and other pests. This ultimately caused the colony to collapse. Yet other studies seemed to contradict this and claimed it does not lower the bees immune system, but does cause them to be confused and disoriented when returning to the hive. And even other studies suggested that neonicotinoids by themselves do not cause a colony to collapse (they do in conjunction with diseases and pests), and yet other studies have shown that neonicotinoids alone will cause them to collapse during overwintering. So, a few conflicting studies, can you clarify what exactly is happening? Or is it different for different situations?

Also does the benefit of using neonicotinoids out weigh the declining bee populations? And is it mainly honey bees that are at risk, or are many native pollinators dying as well?

[TodayWasBoring](#)

As you have surmised it is quite complicated and there is no single cause. Suffice it to say that many bee stressors are involved. Once all data is collected it is up to the scientific community to conduct risk benefit analyses. For the neonics this is the stage where we are at currently.

Hello! In one sentence, what would be the most important thing for a high school environmental science class to know about environmental issues related to toxicology.

[ThomWilson](#)

This is an old saying but it's still at the top of my list: the dose makes the poison. What it means is that we need to understand both the toxicology (which is sometimes referred to as degree of hazard) and how, when, where, and to what extent (e.g., how long) people and other organisms are exposed to chemicals.

Is lead still prevalent in our ecosystems?

[fysic4L](#)

There is less lead in the environment than there used to be, since it was taken out of gasoline. However, there is certainly still lead in the environment. "Elements never forget," says one of our experts. It doesn't disappear once it enters the environment.

Im curious as a dentist which dental material is worse for the human body and the environment, silver amalgam containing mercury or composite resin containing phthalates?

TIA

[Warfrog](#)

colony

Based on what we know today, it would be the mercury.

If you were to rank the current array of environmental issues by [ improvement / cost to implement (time and money) ], how would that ranking look like?

To clarify: Would it make more sense to spend the same amount of time and money on for example tightening up safety precautions against oil spills or reducing the amount of pesticides on a field (R&D of improved pesticides as a cost) in the context of the overall effect on the environment?

[JL1NK](#)

We're not quite sure we understand the question. Here is an alternative perspective. When it comes to chemicals in the environment (consumer, pharmaceutical, etc.) there are policies that are reactive and policies that are proactive. Reactive would be, for example, after a chemical spill and proactive would be before a chemical goes on the market or the design of a chemical. We'd like to see a change in more policy on the design (proactive) or before a new activity occurs and shift away from primarily reactive policies.

What is your favorite chemical reaction?

[Margatron](#)

Fermentation

Hi thanks for doing this AMA. I am a computer science major currently, but I've always felt strongly about toxicology and other areas in environmental science. What opportunities would you say are available for programmers in your field? What kind of outside experience would you say would be helpful to someone like myself looking to be useful to someone in your area?

[Berrydiddle](#)

Environmental toxicology and chemistry relies often on models or data analysis where your skills would be useful. Estimating exposure to chemicals, toxicity estimates for chemicals, and transport of chemical in the environment are examples. I would say take an intro course in env science and see where things go.

What are some important recent findings in nanomaterial toxicity? All I know of is respirable carbon nanotubes.

[What\\_Is\\_X](#)

From an environmental standpoint, most nanomaterials cause physical toxicity, instead of biochemical toxicity. An example is carbon nanotubes, which fill the gut tracts of aquatic organisms, and keep them from feeding and processing food. Another nanomaterial that's of interest (or potentially toxic) is titanium dioxide. It is used in a lot of things, like paint, sunscreen, some food additives. The problem is that when sunlight hits it, it produces very reactive byproducts, and these can cause organisms harm.

More and more people are having health problems related to indoor mold and mycotoxin exposure. I anticipate recent flooding will end up creating many more sick people who will be misdiagnosed with other ailments. How can we get the medical community to recognize this as a serious health issue?

[MyBeachyLife](#)

Actually, public health professionals already know about it. There are times when public health professionals are disconnected from M.D.s and this may be one of those situations. If you contact your local Public Health department however I am sure that they will be able to give you a wealth of information regarding what they are doing about the problem

In your opinion, what is the top emerging contaminant that we should be aware of?

[seankennede](#)

The answer to this question would really depend on the adverse effects of concern -- there are many emerging contaminants that can cause many different types of problems. This also relates back to the amount of exposure a particular individual has to one particular compound. If there are chemicals that are highly toxic but one is not exposed to these, they would likely be of less concern than those with a moderate toxicity that someone is exposed to on a daily basis.

Can you tell me about the risks of exposure to polycyclic aromatic hydrocarbons in individuals that live relatively close to fracking wells?

[leftturnmike](#)

Great question! Scientific studies related to the environmental impacts of fracking are relatively few and far between, but that is starting to change. In the past few years, studies have begun to emerge assessing impacts fracking may have on water quality, air quality, and human/environmental health. Only 2 of those have looked for PAHs in the air. However, both concluded that PAHs are present in the air near these wells at levels that are relevant to human health. So, the relation between fracking and PAH emissions warrants further study. But the data we do have suggests there is an association between fracking and elevated PAH levels in air.

what potential future applications of the research in your field excites you the most?

[CheeseeToast](#)

We work in the field of nanotoxicology. Our goal is to predict the environmental impacts of nanomaterials, which are widely used and have unique properties, most of which are currently unknown. We are excited to develop standardized testing methods for the responsible use and regulation of nanomaterials.

what potential future applications of the research in your field excites you the most?

[CheeseeToast](#)

We work in the field of nanotoxicology. Our goal is to predict the environmental impacts of nanomaterials, which are widely used and have unique properties, most of which are currently unknown. We are excited to develop standardized testing methods for the responsible use and regulation of nanomaterials.

Question about glyphosate, 'Roundup'-type herbicides, which were recently declared carcinogenic. I live next to a 200 acre farm that rotates corn and soybeans. The farmer blankets the crop in pesticides and herbicides two or three times a year. I pull my dogs inside and close the windows when this happens, but I'm still worried about the mist. How worried should I be? I don't know precisely what the farmer is spraying, but there's enough to leave a mist in the air and a chemical odor that I can smell from my house 300 yards away from the edge of the field.

[RemusShepherd](#)

Great question! Glyphosate breaks down quite quickly and an odor does not necessarily indicate a health concern. Nevertheless, contact either your local public health department or your local department of environmental quality. It is possible that you can get them to conduct sampling when the next spray occurs. This is not something to lose sleep over, however at the same time, you are well advised to take it seriously and get the air tested.

How would a non-scientist go about learning about these topics, and what does SETAC do to get this information to the public? Thanks for doing the AMA!

[ocean895](#)

SETAC publishes two journals. One of them, Integrated Environmental Assessment and Management, containing lots of papers that are of interest to non-scientists. Also we publish a monthly newsletter called the SETAC Globe (<http://globe.setac.org/>) that contains many interesting articles summarizing the work being done by SETAC members. We are starting to be more proactive about communicating with the public and have recently launched a blog ([ieamblog.com](http://ieamblog.com)) and we're [HERE](#) on Reddit!

Hi there! May I ask what are the pros/cons of your typical pesticides, and how we can improve them to be most effective?

[9voltWolfXX](#)

Currently pesticides are an essential component of feeding the global population. The alternative would be severe starvation globally. Pesticides need to be safe. Most target a specific function or metabolic pathway in the target organism. This can be a plant in the case of herbicides, insects in the case of insecticides, for fungi in the case of fungicides. Concerns include impact on non target organisms, longevity in the environment, and human toxicity. There are tests required by regulatory authorities which are required to assess safety and identify concerns. Chemical companies also consider these concerns during the R&D phases of Discovery and Development. In many cases the pesticides can be designed to minimize impact before they are registered for use.

hi!

is the use of commercial shampoos/conditioners/soaps damaging to the environment by not being removed in water treatment plants? and is the solution for the average person try to change their habits to avoid this issue, or is it the water treatment plants that need to step up their game?

[lilycama](#)

There are some chemicals of concern that are found in soaps that pass through wastewater treatment plants unaffected. Some of these compounds have the potential to accumulate in sediments, and there have been toxic effects noted on aquatic organisms. There has been a big push in many countries to ban the use of these chemicals, but they are still very common in many products in the USA. If you are looking for a way to personally decrease your impact by not using these chemicals you can look at the active ingredients of products and avoid those containing antimicrobials such as triclosan and triclocarban, as those are two of the compounds found in soap that are currently of interest/concern.

What's for you, the most toxic activity a man can do? A firm? Can it be avoidable?

[Toogoodtotroll](#)

Changing the questions slightly the most toxic compound ever identified by scientists, is (drum roll please) Botulinum A. This is the neurotoxin produced by *Clostridium botulinum*, a bacteria that has to live in anoxic environments. It is said that a drop on the point of a pin is lethal enough to kill 800 people. Humans come into contact with botulinum A most notably through improperly canned foods. So when canning tomatoes make sure the sterilization of the bottles is done properly, then make sure to keep the cans in a COOL place. The boiling denatures the toxin, the cool environment keeps spores (which can remain alive even through boiling) from germinating new bacteria which will produce more toxins. Avoid canned, processed foods where the cans are dented or misformed (throw them away!) and be careful when doing home canning....

How persistent are some compounds in the environment? For example are compounds broken down by microbes, light etc or do they persist for a length of time?

Are there certain classes of compounds that are extremely difficult to degrade and so persist for an extremely long period of time like certain plastics?

[UtyerTrucki](#)

The persistence of chemicals in the environment is entirely dependent on the structure; some chemicals are more susceptible to degradation processes such as hydrolysis, photolysis, and microbial degradation, while others may have a structure that makes them harder to break down. If a chemical is lipophilic, meaning it is more likely to interact with organic matter as opposed to water, it would be more likely to bind to soil or sediment and remain in the environment for a longer amount of time. Some studies have taken sediment cores that have shown corresponding chemical concentrations and usage trends back to the 1970s and earlier, meaning these compounds have persisted for quite a while.

How persistent are some compounds in the environment? For example are compounds broken down by microbes, light etc or do they persist for a length of time?

Are there certain classes of compounds that are extremely difficult to degrade and so persist for an extremely long period of time like certain plastics?

[UtyerTrucki](#)

you have hit the nail on the head. Some compounds, known as POPs (persistent organic pollutants) are very reticent to breakdown. Compounds such as DDT can last for decades in the environment or in the fat tissue of animals or humans. Other compounds breakdown quickly, by many of the mechanisms you mentioned above, microbial, light, UV. Even though compounds break down quickly they may not be benign, for some the break down products (such as epoxide metabolites of polycyclic aromatic hydrocarbons) are actually more toxic than the parent that they metabolized from.

How persistent are some compounds in the environment? For example are compounds broken down by microbes, light etc or do they persist for a length of time?

Are there certain classes of compounds that are extremely difficult to degrade and so persist for an extremely long period of time like certain plastics?

[UtyerTrucki](#)

Depending on the chemical structure, chemicals might degrade or transform in a period of hours or decades. Since the 1970s there have been many global policies to address persistent chemicals. There are tests developed and criteria to define persistence and regulate chemical use in the market. What that means is new chemicals on the market should not be persistent but we are still dealing with legacy chemicals persistent in the environment.

How persistent are some compounds in the environment? For example are compounds broken down by microbes, light etc or do they persist for a length of time?

Are there certain classes of compounds that are extremely difficult to degrade and so persist for an extremely long period of time like certain plastics?

[UtyerTrucki](#)

Environmental chemistry has estimation or measurement methods for to determine persistence of chemicals in the environment. Many organic chemicals that contain chlorine are persistent, however, others are degraded through various mechanisms and are removed from the environment rather quickly.

How important are mushrooms?

[RothkoRathbone](#)

Mushrooms and the fungi associated with them are tremendously important in breaking down and recycling organic matter.

Thanks for the AMA! My brother is getting his masters in environmental chemistry at the moment and I was just wondering what you guys/girls studied in college? Something akin to his course studies?

[Emmmatwatson](#)

We have a few experts here. We studied biology, environmental science, environmental chemistry, and environmental toxicology, to name a few. You can never take too many science and statistics courses!

How extensive is the toxicological testing of the health risk when someone is exposed to multiple contaminants at a time? I imagine not all contaminants behave independently in your body; there may be amplification of the effects of contaminant "A" when contaminant "B" is around.

[PositivePressure](#)

This is a very good question, and also a very difficult one to give a specific answer to. Many mixture toxicity studies have been performed with specific chemicals to determine if they have synergistic (or amplification) effects, antagonistic effects (decreasing the toxicity of each other), or additive effects (compounds don't affect the toxicity of one another). Because people are exposed to so many different chemicals throughout a day, and the chemicals and exposure differs from person to person, determining the risk of this total exposure would be extremely difficult. However, studies have focused on mixtures between compounds that are often found together, or structurally or mechanistically are believed to have the potential to interact with each other.

It seems like we dump huge amounts of soap and shower gel products into our waste water on a daily basis. Has there been any studies on how they affect the environment? Any idea how all those products are removed from the water that we drink/ use again?

[worchestersauce](#)

There have been many studies that have looked into the effects of the chemicals found in personal care products, and the effects vary based on the constituents of the individual soaps. Some of these compounds have been found to pass through wastewater treatment plants unaltered, and have then exerted toxic effects on aquatic organisms. Whether or not the chemical remains in the environment or is broken down depends highly on the structure of the chemical.

Any job openings for an aspiring student about to graduate from the Chemical and Environmental Toxicology Masters program, who also has 3 years of experience in governmental funding of environmental science projects?

Thanks! Looking forward to this AMA.

[The Junkyard](#)

Please check out the SETAC webpage! [www.setac.org](http://www.setac.org)

[deleted]

[\[deleted\]](#)

Yes. This has been very well demonstrated by many scientific studies.