Science AMA Series: We're the 5th Australasian annual meeting of the Society of Environmental Toxicology and Chemistry, Ask Us Anything about Industry, Science and the Environment!

SETAC$_1$*andr*/*ScienceAMAs*[1]

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April 17, 2023

Abstract

Hi Reddit, The Society of Environmental Toxicology and Chemistry is hosting the 5th Australasian annual meeting this week and has asked experts from across academia, government and industry to answer questions on a wide array of environmental issues. The theme for this year's conference is "Industry, Science and Environment: Towards a Sustainable Future". We will have experts across a wide range of environmental science topics including pesticides, metals, pharmaceuticals, nanotechnology, microplastics, oil and gas, risk assessment and remediation in extreme environments, environmental analysis and monitoring, sustainable waste management and human health issues 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 keep it professional. For more information on SETAC http://www.setac.org EDIT: We're here having lunch and answering questions! 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 12:30PM AEST (2:30PM NZDT, 9:30AM AWST, 7:30AM BST, 9:30PM 5/10/16 EST, 6:30PM 5/10/16 PST) until 4:30PM AEST (6:30PM NZDT, 1:30PM AWST, 11:30AM BST, 1:30AM EST, 10:30PM 5/10/16 PST). Edit (5:00pm AEST): And we're done. Thanks for all your questions! We hope you got something out of it! If you're interested in following us on twitter you can do so at https://twitter.com/SETAC_AU Or on Facebook at: https://www.facebook.com/SETACAu Our conference is on for one more day, so you can follow along at the hashtag #setacau2016 Thanks everyone!

the WINNOWER

REDDIT

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SETAC_ R/SCIENCE

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Our conference is on for one more day, so you can follow along at the hashtag#setacau2016
Thanks everyone!

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How were plastic microbeads allowed to be used in so many products for so long?

brownmoustache

Great question! Plastic is considered an inert product and was considered non-toxic - which is why it makes such great food packaging! It has taken a long time for the research to catch up to commercial products (think face washes, toothpaste, household cleaning products). Concern began to grow when recent studies (around 2012) were published that microbeads were found in high concentrations in lakes and rivers including the Great Lakes in Canada. Now that we are beginning to understand microplastics are exerting a toxic effect on our environment, this knowledge is being reflected in legislation changes around the world - banning the use of microbeads in many products. It is often the case with many environmental contaminants that they are in general use and highly distributed before their toxicity in the environment is fully understood and regulated.

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Are there environmental toxicology concerns that are unique to Australia due to the unique flora and fauna? Are marsupials particularly sensitive to anything?

nate

Flora and fauna of Australia have unique evolutionary histories which may translate to differences in sensitivities to contaminants, however the sad reality is that we have relatively few data on native species for comparison. However, on the whole, we typically find little difference in sensitivities from country to country (eg comparing temperate and tropical spp).

There are also few toxicity data for marsupials, but what there are shows considerable variability between species to the same toxicant, and variability within a species to different toxicants. On the whole its a bit hard to say as a group whether marsupials are more or less sensitive to contaminants than are eutherians

Are there environmental toxicology concerns that are unique to Australia due to the unique flora and fauna? Are marsupials particularly sensitive to anything?

nate

Hi Nate. That's a good point because we do have quite unique species here, and therefore it's difficult to know whether or not we can extrapolate from data elsewhere. In relation to marsupials, there are differences in metabolic processes that may impact their response to some toxins when compared to eutherian mammals. For example, koalas have a unique capacity to detoxify/metabolise some compounds due to their unusual diet of eucalyptus (which is actually quite toxic). Other studies, including some focused on fluoride, have shown that there isn't necessarily too much difference in the way that marsupials respond to environmental toxins when compared to other mammals. It is something that would need to be assessed on a case by case basis, as there aren't generalizable rules, but we definitely need to keep these things in mind and not make too many assumptions when setting guidelines.

In Au & Nz who directly controls toxicology reports for the state? And are they publicly accessible?

I.e to say, a general spectrometry analysis.

illbeoff

In Tasmania, those reports are able to be accessed publicly through Right to Know legislation. All reporting is generally available. from the EPA. Don't know about Councils.

What impact could climate change have on microalgae?

kastles8

Algal growth is affected by all sorts of factors, especially temperature and nutrient levels. Climate change is expected to increase water temperatures in many areas, which would increase growth rates of algae including microalgae. Climate change is also expected to increase variability of rainfall, so there will be periods when there is high rainfall, washing nutrients off the land and into waterbodies, and periods of low rainfall, when water will tend to evaporate from rivers and lakes, and the nutrients will become concentrated. Under these conditions we expect the nutrient levels to increase in the

water and feed all kinds of algae, so they will multiply to give blooms. In the ocean, we also expect the water to become more acidic as the CO2 levels rise and dissolve in the water. Some algae, especially those with calcium carbonate skeletons, are likely to be susceptible because the carbonate will tend to dissolve in the more acidic waters.

What is the process like for removing toxins and contaminants from sensitive environments? Is it typically something done by industry or by local governments?

mmm_toasty

Hi mm_toasty -

It really depends on the contaminant and the environment. Sometimes the industry (the polluter) is responsible for clean up, and sometimes it's left to the local, state or commonwealth government.

Processes for clean up can include bioremediation (for oil), dredging contaminated soils and sediments (for sediments), installing better treatment processes (for waste water or sewage discharge) - there's no one size fits all answer.

Hi SETAC,

What is the process for deciding water quality guidelines? Is there typically a lot of industry input (and possibly conflict of interest)?

ch3hg

Hi. Thank you for your question. The development of water quality guidelines involves a multidisciplinary approach utilising research in ecotoxicology, chemistry and ecology. Ideally the process of developing water quality guidelines will involve industry, government and academia. There will at times be a conflict of interest, however it is important to use an independent review process when developing such guidelines.

Hi SETAC,

What is the process for deciding water quality guidelines? Is there typically a lot of industry input (and possibly conflict of interest)?

ch3hg

Good question and one that's often asked. The revision of the National Water Quality Management Strategy is being co-ordinated by the federal Department of the Environment. They have information on their website http://www.agriculture.gov.au/water/quality/nwqms. There are number of workgroups that are focused on specific issues around the NWQMS and they have representatives from stakeholders from government, industry and academia. For toxicants the stakeholders derived a list of high priority toxicants for which there we no or low reliability guideline values (GVs). These GV were revised using consultants and there was a peer-review process for each of GV "fact-sheets". This review process was installed to address any concerns regarding conflict of interest and ensure the GVs were robust. There was also an ability for third-party contribution, e.g from industry that had collected data, and these also would go through the same peer-review process. There is a website being built and these fact sheet will be released soon (we hope!), although their are many layers of approvals that need to occur for these to be finalised. Keep and eye on the Dept of Ag website.

Of the various pollutants and contaminants that wreak havoc on healthy ocean ecosystems, which are the most agregious?

isotaco

Most harmful to what? Fish embryos are sensitive to oil, algae are sensitive to copper, prawns are sensitive to insecticides....If I had to pick one that I was most worried about, I would say carbon dioxide, because of the wide reach of the impact it is having.

Is there any improvement in making water-based paint more environmentally friendly?

P.S: What was for lunch?

BurnZ_AU

Hi BurnZ-AU Lunch was great salad. As for water-based paints, its a bit outside our collective areas of expertise so we might have to ask around and get back to you on that one.

What new technologies/schemes will be coming into use/practice in the near future with regards to oceanic cleanliness?

buzz005

We've heard of ocean bins and strategies to intercept the flows of ocean plastic. But our favourite would be the use of the ocean's natural vacuum cleaners - http://www.billionoysterproject.org/

Hey,

First of all thanks for doing the AMA.

I am about to finish my degree in science, majoring in Chemistry, biology and human biology and really want to work in environmental science, preferably as an analytical chemist. I have applied for a few grad programs down in Canberra but the demand is so high that my chances of getting in that way are very slim. Any suggestions as to how to kickstart my career once I graduate?

MiilkyJoe

Look into doing an industrial traineeship. CSIRO takes trainees, and some of the other labs do too.

Hey,

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MiilkyJoe

Thanks for the question, MiilkyJoe. What sort of postgrad degree are you hoping to do? Applying for honours or masters will both involve finding a supervisor and a project you can do. If you haven't already, I would email and talk to some of your lecturers or demonstrators about what they do. It's a lot easier to get into a post-grad program when you have a project lined up.

Volunteering to help with projects at your uni is also a great way of getting some experience. There may be PhD students that need help with part of a project they're working on.

TL;DR: Talk to your lecturers and demonstrators!

Thanks for doing the AMA!

Based on what's known now, what seems to be doing the most damage to coral reefs?

fsmpastafarian

Hi fsmpastafarian. Thank you for the question. Climate change and ocean acidification. The issues are intrinsically linked, but currently increase in temperature is the most primary issue as we saw recently with the large bleaching event on the Great Barrier Reef.

Thank you so much for taking the time to do this AMA.

How dangerous do you believe the lack of regulation around alternative medicine to be? Do you think that the market is mostly full of products that are unlikely to help or harm or are there real reasons to be concerned that products sold as "natural" could have really sinister effects?

ImNotJesus

Thanks, ImNotJesus! SETAC is generally focused on environmental toxicology. That can sometimes include human stuff but usually as it relates to exposure through our environment. Are you asking about alternative medicine as it relates to environmental exposure?

I've seen reports of prescription medicine contamination entering waterways from waste water from cities. How bad is the impact of that, and are their feasible methods to remove it from the water prior to it having an environmental impact?

kerovon

Hi Kerovon- There are lots of instances of prescription waste entering waterways - on of the most commonly studied compounds is EE2 (the active component in birth control pills) - and that can cause endocrine disruption (alterations in normal hormone function) that interfere with normal hormone action and as a consequence, normal reproduction. The exact impacts depend on the pharmaceutical and the waterway and the plants and animals there....

Tertiary treatment of sewage removes most of these compounds.

Are there any environmental hazards that have recently come to your attention that don't have any public awareness of?

dematalaad

Yes, within Australasia, Triclosan is a contaminant of concern which has not yet received as much attention. This is an antibacterial agent found in numerous domestic personal care products such as toothpaste and kids toys. The risks associated with Triclosan is that it kills Botha he good and bad bacteria and it is a toxicant. It has recently been banned in America and is no longer used in Europe.

Lately, there has been quite a large amount of discussion about the dangers associated with widespread pesticide use. Do you think the level of danger has been overstated by the media and popular culture?

Are there any long term health risks associated with pesticide use in agriculture? Or with GMO foods in general?

EdaciousE

Hi Edacious - Health to the environment, health to people who spray pesticides, or risks to people who eat food sprayed with pesticides? There has been environmental damage associated with pesticide use, and to people who spray pesticides. Fewer studies have found health problems for eating food grown conventionally.

It seems that funding for research on toxicant induced loss of tolerance (TILT) hasn't been historically strong. Research so far seems to be focused on identifying biomarkers that can be used to test for TILT.

Are you aware of any new efforts or research on this topic?

Thank you!

dharmatech

It's a dynamic research area and we're always looking for new ways to monitor toxicant effects and funding is always appreciated

What would you consider the most pressing issue with regards to pollution and contamination in Australasia currently?

mmm_toasty

Great question! It's generated a lot of discussion between the experts. The consensus they came to is climate change,. This is because of it's broad implications for ecosystems and potential to exacerbate the toxicity of other contaminants.

New and emerging contaminants are always the great unknown, though!

We are currently seeing a huge increase in the amount of heavy metals we need...Palladium and platinum ranging from chemical reactions up through widespread use in catalytic converters, Lithium-ion batteries, etc. What is the impact of both the mining and the use of these materials in terms of environmental toxicity, and how can we work towards a cleaner future using such sophisticated materials?

glr123

The impacts of mining can be significant, but are minimised through effective mitigation strategies. Of course, the best way to reduce the impact of those metals is to reduce our use or increase our recycling of those resources. These days we are much better at preventing contamination through regulatory frameworks and environmental quality guidelines. You can check some of them out here: http://www.agriculture.gov.au/water/quality/guidelines

New technologies (and materials) do challenge our regulatory approach. Though we have many a strong group of environmental toxicologist and chemists who work to identify those emerging contaminants and understand what's happening in the environment.

Are there any uncommon factors that make the Australian environment more or less sensitive to the pollution from the oil and gas industries, and would those factors be circumvented or exacerbated by the adoption of nuclear energy?

What is your view on the safety of uranium mining and nuclear waste dumps in Australia?

(If you don't mind answering questions related to nuclear energy)

migshark

Hi Migshark- One thing that makes the Australian environment particularly susceptible to oil and gas pollution is the high level of UV light here - UV can make some components of oil more reactive and more toxic. Other than that, Australia would be no more (and also no less) susceptible to oil pollution than anywhere else.

As far as the adoption of nuclear energy, I don't know that it's a good fit for Australia, as it requires a lot of fresh water, which we have in short supply.

I'll leave your questions on the safety of uranium mining and nuclear waste dumps to a colleague - who will hopefully be able to give you better answers.

Are there any uncommon factors that make the Australian environment more or less sensitive to the pollution from the oil and gas industries, and would those factors be circumvented or exacerbated by the adoption of nuclear energy?

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migshark

Uranium mining isn't especially different to other types of mining and the environmental issues are more often due to the type of rocks containing the ore, i.e. acidic mine drainage is a huge problem because the acidic mine water it makes is full of metals. People have a perception that uranium is more dangerous because it is radioactive but this isn't really the case until the uranium oxide is enriched. In the environment uranium's chemical toxicity is a higher risk than it's radioactivity.

The storage of nuclear waste is another hot topic because people don't like the idea of radioactive substances. Because of this perception there is a high amount of risk assessment and risk management for nuclear storage facilities, which real reduces the risk of any impacts on the environment and people. The highest risk is during the transportation of wastes to the storage facility, where and accident could result in a spill. So maybe having one in the middle of nowhere isn't the best idea.

How bad is coal seam gas mining for our water aquifers?

Darwinium

Hi Darwinium. Thanks for question. The main risks are to surface waters rather than aquifer through spills during operations. Aquifers could be at risks but there are a lot of mitigations and controls around drilling wells properly, but that's not to say that mistakes can't be made. But often the aquifers are well separated from the coal beds.

I've seen speculation about harm resulting from nanoparticle contamination, but I haven't really followed the field very much. How much potential risk do nanoparticles pose, either to people or to the environment? Is this something that will be a growing threat in the future?

thepluralofanecdote1

Hi Thank you for the question. The issue with nanomaterials is that, while these materials are very popular in many commercial products, the research into the transport, fate and impact of nanomaterials on the environment is still ongoing and we still have a lot to learn. Like most pollutants the risk that nanoparticles pose to people or the environment will depend on the type and chemical nature of the nanoparticle, the concentration in the environment and the route of exposure to biota within the environment. This is a topic that many of our researchers are currently investigating. Here are some interesting articles on nanoparticles.
http://www.sciencedirect.com/science/article/pii/S0269749113000444
http://link.springer.com/article/10.1007/s11356-014-3994-1

So- bisphenol-A (BPA). Benign, or Satan incarnate?

Does "BPA-free" mean they're using another, different compound, or that they get the stoichiometry just right so there's no monomer?

gastronought

Hi gastronought Thanks for the question. BPA is unsafe, the best way to assess the safest plastics to use is to look at the Resin identification code and avoid plastics numbered 3 6 and 7.

How much of an issue is the long term persistence of glyphosate (Roundup) in soil?

DrEvanB

Hi DrEvanB That's a really good question thank you. We're looking for an expert to help us answer your question.

Is there any new research on possible emerging contaminants or everyday products that may be toxic to wildlife?

Also, given that society is attempting to make everything smaller (nanotechnology to make phones faster and hold more storage), is it possible that we will be unleashing billions of nanoparticles without knowing the effects?

redpanda2

Hi redpanda2. There is a lot of research currently underway in Australasia to understand the fate and transport, as well as biological impacts of emerging contaminants to wildlife. This is particularly important in the Australasian region given that we have so many unique native species.

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redpanda2

We've also had some great talks at this year's conference on the potential transport, fate and toxicity of nanomaterials in the environment, including nanomaterials in waste water. Here is an article you may find interesting http://pubs.acs.org/doi/abs/10.1021/es301487s