

Keep Engaged with Toxicology
News in BC

Dedicated to Toxicological Issues in Population and Environmental Health in British Columbia

May 2018

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Raina Fumerton
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Contributors and Reviewers
Yasi Afshari
Michael Jonasson; English Editor
Tissa Rahim

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Contact us

BC Toxicology News Monthly Bulletin could be reached at

604 999 6185
BCTOX@yahoo.com
<https://blogs.ubc.ca/bctox2015/>

To contribute to the next issues, provide your opinion or report a mistake, please email us, your feedback is greatly appreciated.

--- Different Mother's Day wish for B.C. moms working to save lives in fentanyl crisis. ([Read more](#))

Summary of Toxicology News in BC and Health Regions in April and May 2018

Reza Afshari*, Environmental Health Services, BC Centre for Disease Control, BC. Reza.Afshari@bccdc.ca [Editorial 2017-05-28]

Public Health and Environmental Toxicology: What is BCTOX and why?

Health professionals (HP) including policymakers, health educators and researchers need to be regularly updated on environmental toxicology issues to keep up with rapidly evolving toxicology information, emerging health risks from environmental chemicals and to manage issues that are locally highlighted in the popular press and news media.

Environmental toxicology training is limited during education, and when HPs enter the field, they lack information on the responsibilities for regulation and risk communication among local, provincial and federal agencies, as well as their relations to international organizations, scholarly articles, and private sectors, including industry¹. All of these factors lead to avoidable confusion.

BCTOX acts as a local up-to-date resource to answer current toxicology issues. The business model of BCTOX is flexible in order to maximise its applicability. BCTOX is also still developing, and will be determining its future directions along the way.

BCTOX acts like a pendulum. It mobilises your interventions to other places where they can also be used, and also back-translates the health activities that have had a "life outside of the health system" and have made societal impacts. While BCTOX is not official and not liable for the reported news from media, it is BC-related and full of concise information that is handpicked and fun to read. BCTOX keeps you engaged with toxicology news in BC.

BCTOX is full of inspiring ideas dedicated to B.C.

Major toxicological statistics March 2018

Mortalities In total, around 700 premature deaths could be attributed to toxic exposures in BC in May including:

- **ACUTE exposures;** ≈
 - ≈160 due to illicit drug overdose
 - 10 due to suicides (CO, drugs and alcohol)
- **CHRONIC current and past exposures;**
 - 500 due to smoking and tobacco use,
 - 81 (air pollution),
 - 11 (radon)
 - 7 (asbestos)

These are equal to overall 15×10^{-5} population toxic exposure-induced deaths in March alone, including 2.4×10^{-5} acute and 13×10^{-5} chronic toxicities (estimations are subject to assumptions and limitations, and overlaps are possible (see BCTOX 2(8): 103)).

Morbidities Around 2200 calls were made to BC-DPIC (estimated from August 2017)

Sola dosis facit venenum

Only the dose makes the poison!

Paracelsus (1493 – 1541 CE)

Summary of Toxicology News for First Nations Populations, April and May 2018, BC

➤ Tripartite health initiative for \$30 million

The Government of Canada, the Province of British Columbia and the First Nations Health Authority (FNHA) will each invest \$10 million over two years for a total funding commitment of \$30 million for Mental Health and Wellness.

Grand Chief Doug Kelly; Chair of the First Nations Health Council:

"These investments and the priorities they address are the result of the engagement we have done with our regional and sub-regional caucuses," said Grand Chief Doug Kelly, chair of the First Nations Health Council. "They've told us that untreated trauma and mental health and substance use issues are perpetuating the physical, psychological and economic disparities suffered by our people. By making these investments today, we are building the foundation of our shared vision of healthy, self-determining and vibrant First Nation children, families and communities."

[\(Read more\)](#)

➤ Kinder Morgan

--- Making a living by burning poisons

--- The curse of easy energy

[\(Read more\)](#)

➤ B.C. coroner releases report into deaths of young adults transitioning from government care

The number of deaths involving young people who were Indigenous – 68 of the 200 – is concerning according to Shannon McDonald, deputy chief medical officer of the First Nations Health Authority.

[\(Read more\)](#)

➤ Citizens vow to make community safe again

A movement against drugs and alcohol is gaining momentum in the First Nations community of Hitacu.



Hitacu rallies against drugs and alcohol

Photo adopted from BC Local News

[\(Read more\)](#)

Naloxone kits are available in 1,500 locations in BC, including First Nations sites and community pharmacies.

[\(Read more\)](#)

Summary of Toxicology News for Fraser Health, April and May 2018, BC

➤ Fentanyl deaths

Fraser Health Authority had the highest number (377) of illicit drug overdose deaths with fentanyl detected in 2017, followed by Vancouver Coastal Health (337) and the Interior Health Authority (200).

[\(Read more\)](#)

➤ Survey for drug users (Health Chat)

Fraser Health launched survey for drug users. Investigators are looking to connect with “the hidden population” making up a large number of overdose deaths in the province.



Drug use survey

We've created this survey to ask you – whether you are a person who uses drugs or you know someone who does – how we can better support people who use drugs.

The survey is anonymous, and will take about five minutes to complete.

[Next >](#)

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[Online, anonymous survey](#)

Those using alone and in their homes are a target. Results will be used to determine what steps the Health Authority can take next that “will make the biggest difference.”

The anonymous survey aims to identify barriers to support and how services could be improved.

[\(Read more\)](#)

➤ Overdose and school graduation

Fraser Health warns of substance use, overdose ahead of graduation.

[\(Read more\)](#)

➤ Non-profit offers free used needle recovery service

Lookout Housing and Health Society is a charitable organization and social safety net.

<https://lookoutsociety.ca/>

[\(Read more\)](#)

Summary of Toxicology News for Interior Health, April and May 2018, BC

➤ Interior Health launches website targeting people who use drugs alone

57% of overdose deaths in 2017 occurred among people who were using illicit drugs alone in BC. Interior Health launches website targeting people who use drugs alone. All responses to their survey will be anonymous.



<https://www.usesafe.ca/>

➤ Over 1000 Kokanee Salmon have been found dead since May 25th.

The government is investigating over 1,000 kokanee salmon washed up on the northern shores of Okanagan Lake since May 25.



Photo adopted from Castanet

[\(Read more\)](#)

➤ Spread of biosolids in Kamloops

The City of Kamloops contractor will be spreading biosolids in Barnhartvale. About 12,500 tonnes of biosolids is produced each year through the city's sewage-treatment plant.

[\(Read more\)](#)

➤ A real-time, interactive water advisory map has been launched by IH

<https://drinkingwaterforeveryone.ca/>

[\(Read more\)](#)

Summary of Toxicology News for Northern Health, April and May 2018, BC

➤ **Permit smoking or inhaled forms of marijuana in hospital settings.**

It is unlikely that the currently developing policies in Northern Health or other Health Authorities permit smoking or inhaled forms of marijuana in hospital settings.

“Administering marijuana for in-patient settings is a virtually impossible task without changes in regulations and legislation, according to Dr. Pippa Hawley of the BC Cancer Agency.”

--- Pharmacists are not permitted to identify, dispense, relabel or store medical cannabis.

[\(Read more\)](#)

➤ **Water Quality Advisory Continues in Kitimat**

The advisory was issued in conjunction with Northern Health on May 7th, due to high turbidity in the Kitimat River.

[\(Read more\)](#)

Summary of Toxicology News for Vancouver Coastal Health, April and May 2018, BC

➤ **Over 120 BC schools report unsafe levels of lead in drinking water**

More than 120 of those schools had a sample that failed to meet the Canadian standard for lead in drinking water.

The Canadian standard for lead in drinking water is 0.01 mg/L.

“BC lags behind Ontario, which has mandated testing at both schools and daycares since 2007 and recently beefed up its requirements.”

[\(Read more\)](#)

➤ **An increase in drug overdoses in the Vancouver area**

Health officials are warning of an increase in drug overdoses in the Vancouver area.

Potential reasons for the surge include

- ✓ Social assistance cheques being sent out
- ✓ High concentrations of fentanyl in heroin

--- “Take-home naloxone kits have helped lower the number of calls, because friends or family members can immediately respond to an overdose.”

[\(Read more\)](#)

Other news – Reminders from the past

➤ **Green-coloured opiate (A report from Nov 2017)**

Vancouver Coastal Health issues warning about green-coloured opiate after a rash of overdoses in the Downtown Eastside.

Seven people overdosed (muscle rigidity and constricted pupils) at the Maple Overdose Prevention site after injecting a toxic, green-coloured drug.

- ✓ Do not use alone, have somebody there who can respond if there is an overdose,
- ✓ Use a small amount

[\(Read more\)](#)

Summary of Toxicology News for Vancouver Island, April and May 2018, BC

➤ **A rash of overdoses in Victoria (April)**

“Victoria patrol officers responded to five overdoses within a nine-hour period between Thursday night and Friday morning, exhausting their supply of naloxone”

Emergency crews responded to more than 23,000 calls about overdoses in 2017 in BC.



Photo adopted from Times colonist

[\(Read more\)](#)

➤ **Increased number of deaths due to overdose in March**

“Vancouver Island Health Authority is tied with Vancouver's Health Authority for the highest rate of illicit drug overdose deaths, with 37 deaths per 100,000 people.”

The island saw 28 overdose deaths in March, compared with 16 deaths in one month earlier.

[\(Read more\)](#)

➤ **100,000 visits since opening first overdose prevention site in Victoria in December 2016**

There are now nine overdose prevention and supervised consumption sites on Vancouver Island.

[\(Read more\)](#)

➤ **Island Health issues overdose advisory in Port Alberni in April**

There was a spike in overdoses in Port Alberni from heroin use, both via injection and smoking.

Use Naloxone If You Have It.

Strategies for safer use:

- New drugs - try a small amount first
- Avoid using alone, use with a friend
- Stagger your use with friends so someone can respond if needed
- Carry Naloxone and have an overdose response plan
- Go to the Overdose Prevention Site - open 8am-4pm
3699 3rd Avenue, Port Alberni

April 6th, 2018

island health

[\(Read more\)](#)

Reference

1. Liverman CT, Ingalls CE, Fulco CE, et al. Toxicology and Environmental Health Information Resources: The Role of the National Library of Medicine. Institute of Medicine (US) Committee on Toxicology and Environmental Health Information Resources for Health Professionals; Washington (DC): National Academies Press (US). 1997.

Clinical toxicology and Drug and Poison Information Centre

BC Drug and Poison Information Centre

British Columbia

The most common drug-related generic categories & generic substances from Jan to Aug 2017 were analgesics, sedative/hypnotics/antipsychotics, stimulants and street drugs, cardiovascular drugs, vitamins, hormones and hormone antagonists, dietary supplements/herbals/homeopathic, antihistamines, topical preparations and antimicrobials.

The Poison Information (24-Hour Line) is available: 604-682-5050 for the lower mainland and 1-800-567-8911 for outside lower mainland.

Differences in Strategies for Reducing Opioid-Overdose Deaths in Canada and States

Unlike Canada where the overdose-reversal drug naloxone available without a prescription, in 36 US states possession of naloxone without a prescription illegal.

Medically supervised injection facilities in Canada is legally approved; there are few if any in the States.

Rates of criminal-justice involvement remain lower in Canada than rates in the United States [but increasing].¹

Reasons for refusing or accepting emergency department-based take-home naloxone in BC

➤ **Reasons for refusing**

- ✓ Not at risk of overdose
- ✓ Their ED visit was not the right time or place for take-home naloxone.

➤ **Reasons for accepting**

- ✓ Wanted to save the lives of others.

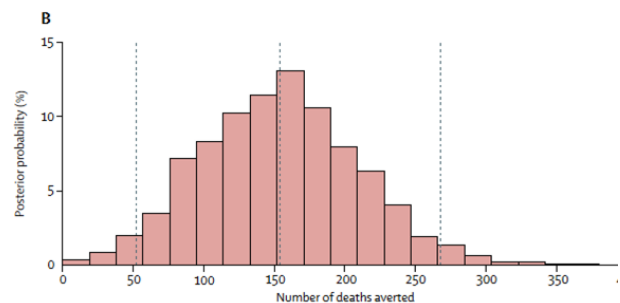
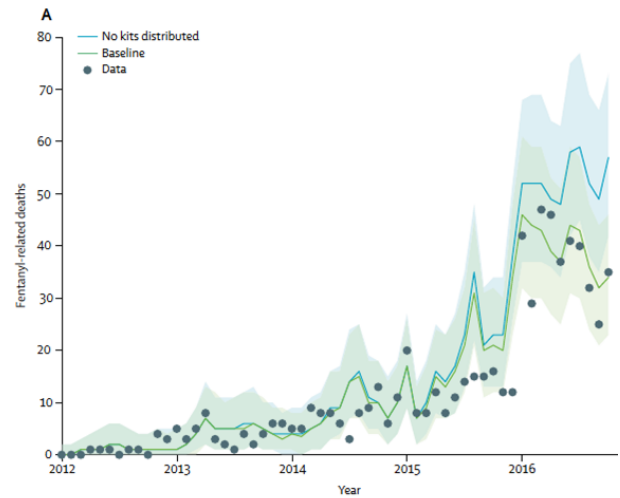
--- Those refusing emergency department-based take-home naloxone may accept elsewhere if referred to appropriate community services for overdose risk education and take-home naloxone distribution.²

Estimated number of deaths averted from Jan 1 to Oct 31, 2016, for the retrospective scenarios. The scenarios were: the actual number of take-home naloxone kits that were distributed (baseline); the rate of fentanyl in the supply was the same as in 2015; all the kits distributed in 2016 were instead distributed on Jan 1, 2016; the population of people who use drugs was halved; and the kits were distributed on Jan 1, 2016, and the at-risk population was reduced by a half. Middle line is the median, shaded area is the 50% credible interval, whiskers show the 95% credible interval, and diamonds show the 5% outliers. (figure adopted from Irvine MA, et al.)³

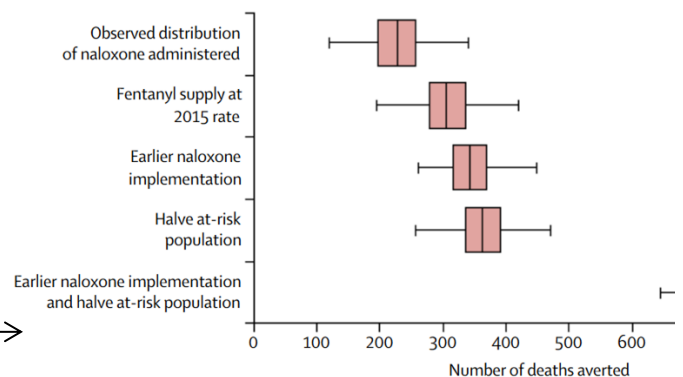
298 deaths were averted by the take-home naloxone program in BC

499 ambulance-attended overdoses and 2,121 illicit drug-related deaths (677 [32%] deaths related to fentanyl) were recorded between 2012 and 2016, mostly since January, 2016. In the same period, 19,074 take-home naloxone kits were distributed.

Authors estimated that 298 deaths (95% credible interval [CrI] 91-474) were averted by the take-home naloxone programme. Of these deaths, 226 (95% CrI 125-340) were averted in 2016.



Total naloxone impact on fentanyl-related deaths (A) Comparison of the number of fentanyl-related deaths between the actual distribution of take-home naloxone kits (baseline) and a counterfactual scenario in which no kits were distributed. Shaded area shows the respective 95% credible interval. (B) Estimated number of fentanyl-related deaths averted during the study period due to distribution of take-home naloxone kits. Dashed lines are the median and 95% credible intervals. (figure adopted from Irvine MA, et al.)³



Clinical toxicology and Drug and Poison Information Centre

Fentanyl urine testing in in rural BC

In a pilot study, “24 participants completed the urine test and first interview. Among them 4 had a positive fentanyl urine test.

Later, 15 clients completed the second questionnaire, 10 of whom reported introducing a behavior change after testing and the remaining 5 indicated being already engaged in harm reduction practices.

All four clients who tested positive completed the second questionnaire; all but one indicated adopting behaviors towards overdose prevention.”⁴

Hospitalization among street-involved youth who use illicit drugs in Vancouver BC

From January 2005 to May 2016, 1,216 youth participated in the study and 373 (31%) reported hospitalization in the previous 6 months.⁵

➤ **The top reported medical reasons for hospital admission were:**

- ✓ Mental illness (38%),
- ✓ Physical trauma (13%),
- ✓ Drug-related issues (13%)

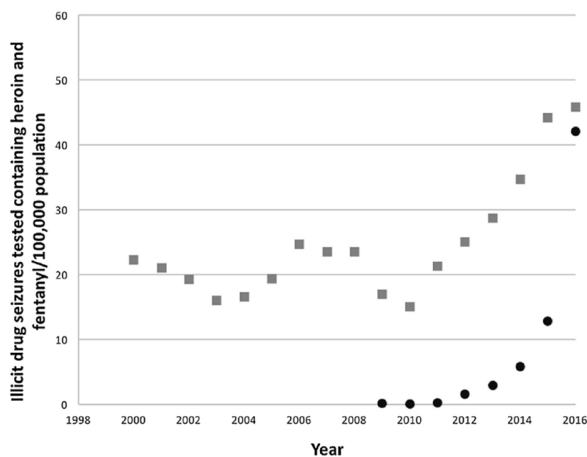
➤ **Factors significantly associated with hospitalization were:**

- ✓ Past diagnosis of a mental illness
- ✓ Frequent cocaine use
- ✓ Non-fatal overdose (AOR = 1.76; 95% CI 1.37-2.25),
- ✓ Homelessness (AOR = 1.40; 95% CI 1.16-1.68) (all p < 0.05).

Fentanyl and heroin contained in seized illicit drugs and overdose-related deaths in BC

Fentanyl is increasingly being found combined with other opioid and non-opioid illicit drugs. Investigators found the following associations:

- ✓ The number of seized fentanyl samples and total overdose deaths ($R^2 = 0.97$)
- ✓ Seized fentanyl and fentanyl-detected overdose deaths ($R^2 = 0.99$),
- ✓ The number of seized heroin samples and total overdose deaths ($R^2 = 0.78$).



Illicit drug seizures tested and containing heroin and fentanyl in British Columbia from 2006 to 2016. *Data obtained from the Health Canada Drug Analysis Service. Circle=fentanyl, square=heroin (figure adopted from Baldwin N, et al.)⁶

Willingness to test urine in BC

Willingness of people who inject drugs for drug checking offered within supervised injection services were studied among 180 subjects.⁷

Positive associated with willingness to frequently check drugs at supervised injection services exists for:

- ✓ Female gender (Adjusted Odds Ratio 95% CI = 2.31 (1.20-4.46)),
- ✓ Homelessness (2.36 (1.14-4.86)),
- ✓ Drug dealing (2.16 (1.07-4.33))

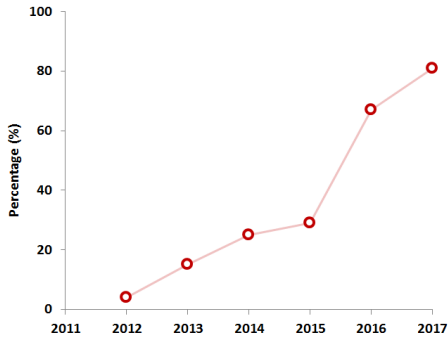
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BCTOX's Toxicology Surveillance of Drug Overdoses and Forensic Toxicology in BC (i)
MARCH (last update) 2018

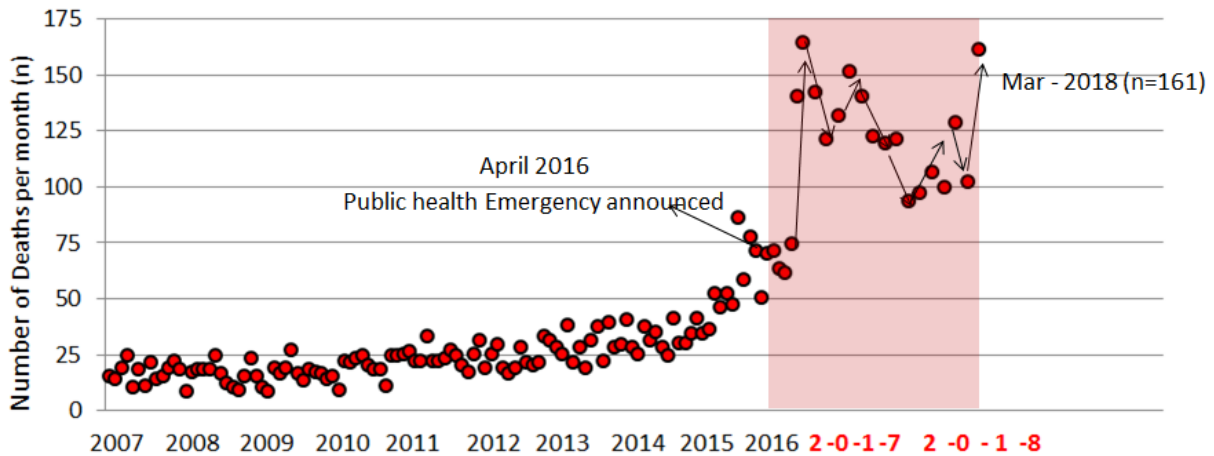
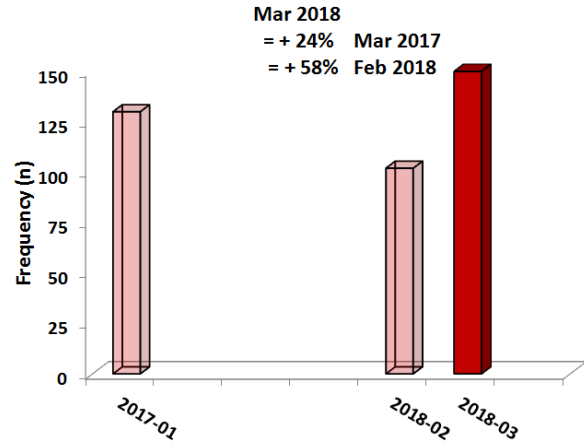
Fentanyl Detected Illicit Drug Overdose Deaths in BC (2012- 2017 July)

Data from (BC Coroners Service 2017-12-31 -) (accessed Feb 20, 2018) [BCTOX graph]



Estimation of Illicit drug overdose attributed deaths in BC in March 2018 (accessed May 28, 2018)

The number of Illicit drug overdose deaths in March 2018 was 161 (Data from the BC Coroners Service 2018-05-10), which is 24% higher than March 2017, and 58% higher than last month (accessed May 28, 2018) [BCTOX graph]



Illicit drug overdose deaths per month in BC (2007 to Ma4, 2018) [Data from BCCoronersService 2018-05-10]. [BCTOX graph] The pattern of overdose deaths suggests that the sharp increase in deaths has reached a plateau. (accessed May 28, 2018) [LAST UPDATE]

[\(Read more\)](#)

Drug testing in Vancouver

Reza Afshari, Environmental Health Services, BC Centre for Disease Control, BC. Reza.Afshari@bccdc.ca

The BC Coroners Service reported that highly potent fentanyl was detected in 83% of 1,400 overdose deaths in BC in 2016,¹ which is the main cause of increased overdose deaths in BC. March 2018 represents deadliest, but December 2017, month for illicit-drug overdose deaths in BC.²

Drug testing would act as an effective personalized health message to the clients, and they may adopt safer drug-use practices. According to a recent study, Insite clients who checked prior to consumption and got a positive result were 10 times more likely to reduce their dose and clients who reduced their dose were 25% less likely to overdose.³



Photo adopted from Vancouver coastal Health News Release.³

Recently, a drug-checking machine (Fourier-Transform Infrared Spectrometer (FTIR) on site) is being offered to BC music festivals as summer season approaches.⁴

In addition, in a pilot study in rural areas of BC, 24 participants completed the urine test at the time of the first interview. Among them, 4 had a positive fentanyl urine test. Later 15 clients completed the second questionnaire, 10 of whom reported introducing a behavior change after testing and the remaining 5 indicated being already engaged in harm reduction practices. All 4 clients who tested positive completed the second questionnaire; all but one indicated adopting behaviors towards overdose prevention.⁵

In another study, willingness of people who inject drugs for drug checking offered within supervised injection services were studied among 180 subjects.⁶ Positive associations with willingness to frequently check drugs at supervised injection services were reported for females (adjusted Odds Ratio 95% CI = 2.31 (1.20-4.46)), homelessness (2.36 (1.14-4.86)), and drug dealing (2.16 (1.07-4.33)).

In addition, drug testing leads to an accountability mechanism that comes into place between a dealer and a consumer or consumer safety principle that does not exist otherwise.⁷

Future interventions could include (1) offering the program outside of supervised consumption sites⁷, (2) attracting the population at greater risk such as people using at home alone.⁷



Insite offers drug testing Monday-Wednesday, 10 a.m.-5 p.m. PT. (Radio-Canada). Photo adopted from CBCNews.¹

Since overdose prevention sites have opened in BC, 800,000 people have visited the sites, saving 4,500 lives from possible fatal overdoses according to Judy Darcy.²

Mother's day – May 13

Different Mother's Day wish for B.C. moms working to save lives in fentanyl crisis.⁸

momsunited
to end the war on drugs

([Read more](#)) - #listentomom ([Read more](#))



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Occupational toxicology in BC – March 2018

The BC Day of Mourning with 40 ceremonies marking deaths related to work

How many cases died of work related toxic exposure in BC in 2017?

- 158 work-related deaths accepted by WorkSafeBC in BC in 2017.
- Among them 87 (55%) were due to occupational diseases, largely from exposure to asbestos [--- mesothelioma] decades ago, and 71 (45%) resulted from traumatic injury, including 28 from motor-vehicle incidents.¹
- Deaths from occupational diseases are on rise (33% increase from 1996 and 2017). In the same period, overall work-related deaths decreased by 30 per cent since.¹

[\(Read more\)](#)

- The *Canadian Labour Congress* created and held the first National Day of Mourning ceremony on April 28, 1984, making Canada the first country to formally commemorate workers killed in the workplace.² It was officially designated as a national observance in 1991.³

[\(Read more\)](#)

How many ceremonies have been planned in BC?

- Hundreds of people gathered, 40 B.C. communities organized, and in Vancouver, the Olympic cauldron at Jack Poole Plaza was lit.³



Photo adopted from Global News³

[\(Read more\)](#)

Process safety initiative

What is the “process safety initiative”?

- WorkSafeBC’s process safety focuses on preventing catastrophic outcomes, such as fires, explosions, and exposure to hazardous substances,
- It involves the prevention of leaks, spills, equipment malfunctions, corrosion, component failures, and upset conditions with serious risks to the health and safety of workers (and, sometimes, the public).⁴

[\(Read more\)](#)

B.C. must learn from asbestos-related deaths for regulation of nano-particles, e-cigarettes

- Twenty years after heavy restrictions on exposure to asbestos, BC is still reeling from its negative health impacts.⁵
- The delay in regulation for asbestos exposure should be a warning to regulators to accelerate regulating exposure to toxic substances, most notably engineered nanoparticles, according to Dr. Christopher Carlsten

[\(Read more\)](#)

Airborne carcinogenic chemicals at Kits pool

What happened?⁶

- Potentially dangerous chemicals were released into the air from pool renovation work.
- People walking near Vancouver’s Kits pool in March may have noticed a strong smell.

What was the causing chemical?

- Polyester resins (organic solvents) were being sprayed in the pool under scaffolding and a tarp with inadequate ventilation.
- This led to an objectionable odor (styrene and methyl ethyl ketone)

What could be their health effects?

- Irritation to the skin and eyes
- Long-term exposure could be carcinogenic

Apparently no health effect was reported from the workers or the public.⁶

[\(Read more\)](#)

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- 4 CanadianBiomass-2018-04-27. WorkSafeBC information sessions focus on process safety . <https://www.canadianbiomassmagazine.ca/education/work-safebc-information-sessions-6806>.
- 5 TheStarVancouver-2018-04-30. B.C. must learn from asbestos-related deaths for regulation of nano-particles, e-cigarettes: expert. <https://www.thestar.com/vancouver/2018/04/30/bc-must-learn-from-asbestos-related-deaths-for-regulation-of-nano-particles-e-cigarettes-expert.html> (May 23, 2018).
- 6 News1130-2018-04-29. "Objectionable odour" signaled airborne carcinogenic chemicals at Kits pool, says WorkSafe BC. <http://www.news1130.com/2018/04/29/objectionable-odour-signal-airborne-carcinogenic-chemicals-kits-pool-says-worksafe-bc/> (May 25, 2018).

Climate change in BC

Climate change Historical data from 1900-2013 in BC

Historical data in BC from 1900-2013¹ shows that:

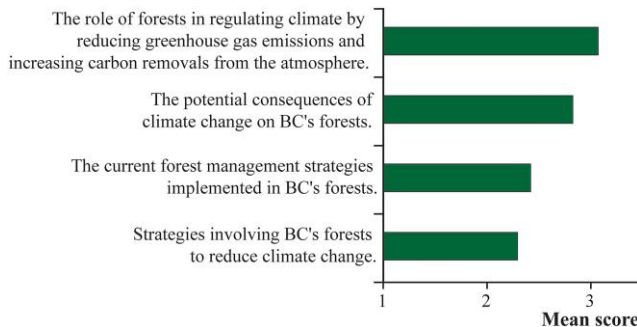
- Average annual temperature warmed by 1.4 °C across the province
- The night-time minimum average temperature in winter in B.C. increased by 3.1 °C
- Annual precipitation increased across the province overall
- The average sea level has risen along most of the B.C. coast
- Lakes and rivers have become free of ice earlier in the spring
- Water in the Fraser River is warmer in the summer

[\(Read more\)](#)

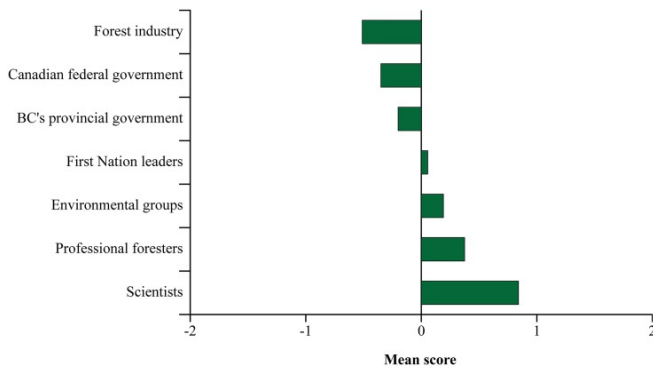
BC Public perceptions about climate change mitigation in forest sector

A recent study in BC (n=1,484 completed surveys) found that greater levels of public support exist in BC in regard to:

- Rehabilitation strategy (e.g. reforestation of unproductive forest land),
- Followed by conservation strategies (e.g. old growth conservation, reduced harvest),
- As compared to enhanced forest management strategies (e.g. improved harvesting and silvicultural techniques).²



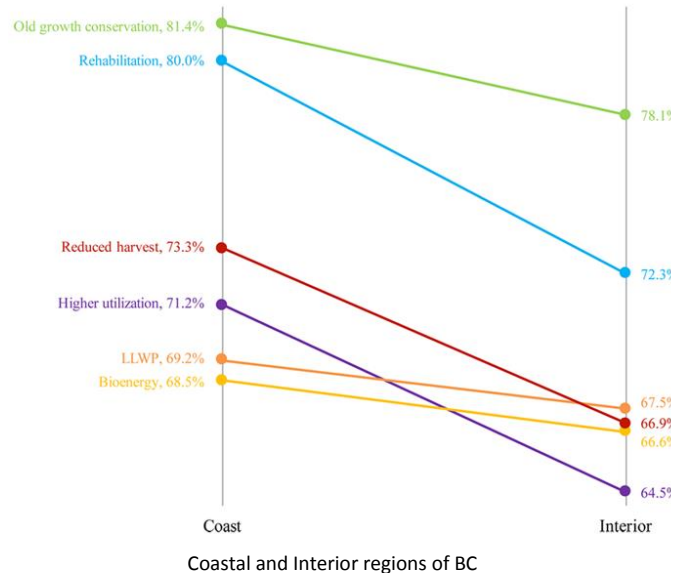
Mean scores representing the degree of knowledge about four different topics related to climate change in the context of forests and their management (1= not at all knowledgeable and 5= very knowledgeable). Figure adopted from²



Mean scores representing the level to which respondents trust the groups of actors when it comes to providing information about climate change issues in BC's forests, with -2 = strongly distrust and 2 = strongly trust. Figure adopted from²

Climate change Historical data from 1900-2013 in BC

When a set of potential forest carbon mitigation alternatives and perceived effectiveness were discussed and prioritized among stakeholders and Indigenous Peoples, different results were obtained.



The average cumulative-derived preference for the six strategies on the coast and the interior. The derived preference of each strategy was calculated by summing, for each objective, the product of the average performance of a strategy against an objective. The resulting score was transformed into a percentage by dividing it with the maximum possible score of a strategy.³ ---stakeholders and Indigenous Peoples.

BC floods a warning of what's to come [?]

It's the second year in a row that parts of the Interior have been hit by massive floods.⁴

- BC floods are a warning of what's to come, climate change researchers say.⁵
- It's not easy to connect extreme weather events to global warming.⁴
- There is a real concern that what we're seeing may in fact become the new normal according to Public Safety Minister Mike Farnworth.⁴
- For those caught in rising waters, the price is financially and emotionally devastating.⁵



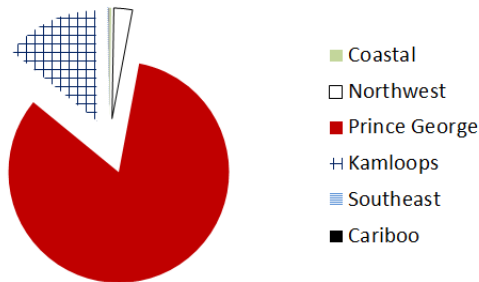
To access the photo [click here](#) [\(Read more\)](#)

Wildfires in BC – 2018

Current Statistics from BC Wildfire service shows that a total of 25,958 hectares burned from April 1, 2018 to May 27, 2018 (current fiscal year) in BC.

Distribution of wildfires in BC from April 1, 2017 to Dec 31, 2017 is shown in the figure. Source of data BC Wildfire Service [BCTOX Graph] (BC-Wildfire-Service)

[\(Read more\)](#)



Distribution of wildfire in BC

Wildfires in BC

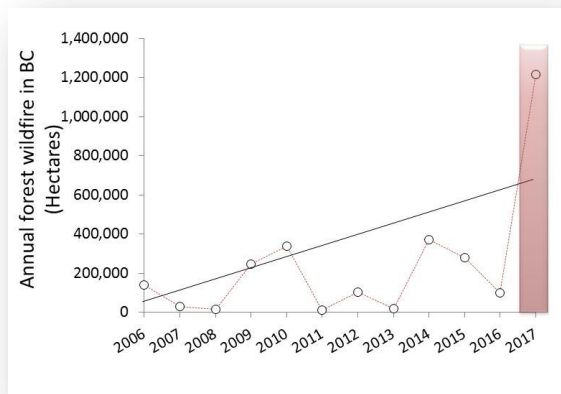
2006 – 2017

Mean (min - max) wildfire in BC from 2006 to 2017 were:

- Total fires was 1,844 (653 (2011) - 3064 (2009)),
- Total hectares 154944 (12604 (2011)-369 (2014))
- Total cost 182 (54 (2011) - 297 (2014)) millions dollars

Among them 39% were caused by people and 61% were caused by lightning.

Total wildfire from April 1, 2017 (past fiscal year) to Dec 31, 2017 in BC was 12,154 km².



Annual forest wildfire in BC (Hectares) (2006 to 2017)

Depicts wildfire from April 1, 2017 (past fiscal year) to Dec 31, 2017 (1,215,494 hectares) Source of data BC Wildfire Service [BCTOX Graph]

--- Values related to 2017 are released as estimates and subject to modification (increase or decrease) at later stages.

Air quality and outdoor exercise


Acute subclinical effects of air pollution exist in older adults exercising outdoors in winter.⁶

An interquartile increase in the Air Quality Health Index was associated with a significant increase in heart rate (0.33%) and significant decreases in forced expiratory volume (0.30%), and systolic (0.28%) and diastolic blood pressure (0.39%).⁶

Reference

1. gov.bc.ca. Government of British Columbia. Impacts of Climate Change. <https://www2.gov.bc.ca/gov/content/environment/climate-change/adaptation/impacts> (accessed Mar 26, 2018).
2. Peterson St-Laurent G, Hagerman S, Kozak R, et al. Public perceptions about climate change mitigation in British Columbia's forest sector. PLoS One 2018;**13**(4):e0195999.
3. Peterson St-Laurent G, Hoberg G, SRJ S. A Participatory Approach to Evaluating Strategies for Forest Carbon Mitigation in British Columbia. . Forests 2018;**9**(4):225.
4. CBCNews-2018-05-15. The new normal? It's too early to blame B.C.'s floods on climate change, scientists say. <http://www.cbc.ca/news/canada/british-columbia/the-new-normal-it-s-too-early-to-blame-b-c-s-floods-on-climate-change-scientists-say-1.4662925> (accessed May 29, 2018).
5. CBCNews-2018-05-24. B.C. and N.B. floods a warning of what's to come, climate change researchers say. <http://www.cbc.ca/news/technology/climate-change-b-c-n-b-river-flooding-1.4676032> (accessed May 28, 2018).
6. Stieb DM, Shutt R, Kauri LM, et al. Cardiorespiratory Effects of Air Pollution in a Panel Study of Winter Outdoor Physical Activity in Older Adults. J Occup Environ Med 2018.

Toxic exposure mediated via FOOD in BC (II) - BCTOX®
April and May 2018

Selected Toxicological related food recalls in BC		Updated 2018-05-29	
Dates	Food (Company / Firm)	Reason to recall	
2018-05-25	Ruffles brand Regular Potato Chips recalled due to undeclared milk		
2018-05-18	Updated Food Recall Warning (Allergen) - Jongga brand Kimchi Ramen dried soup mix recalled due to undeclared milk		
2018-05-17	Updated Food Recall Warning (Allergen) - Fisher Ma Ma and Liao Bu De brand fish products recalled due to undeclared egg	Class 1	BC+
2018-04-27	Updated Food Recall Warning (Allergen) - Golden Ocean Inc. brand and Liao Bu De brand fish products recalled due to undeclared egg	Class 1	Possibly National
	Preservation Society brand marmalade and jam recalled due to undeclared sulphites		
2018-04-14	Pink Grapefruit Honey Marmalade	229 ml	
	Christmas Clementine Marmalade	229 ml	
	White Grapefruit Marmalade with Vanilla	229 ml	
	Strawberry-Rhubarb Jam	229 ml	
2018-04-12	Food Recall Warning (Allergen) - Dong Won brand Frozen Shrimp Cutlet recalled due to undeclared egg	Class 1	BC+
2018-04-12	Updated Recall Warning (Allergen) - Durra brand seasoning products recalled due to undeclared sesame & wheat	Class 1	Possibly National
2018-04-11	Food Recall Warning (Allergen) - Kamy brand Salad Dressing recalled due to undeclared milk and wheat	Class 1	Possibly National
2018-04-05	Correction - Food Recall Warning (Allergen) - Sensations brand Pecan-Crusted Cheesecake Collection recalled due to undeclared wheat	Class 1	BC+
2018-04-04	Recall Warning (Allergen) - Sensations brand Pecan-Crusted Cheesecake Collection due to undeclared wheat	Class 1	BC+

During April and May 2018, no commercial food, but one due to sulphites recall was made due *chemical* poisoning; however, undeclared milk, egg, seame and wheat caused eight food items to be recalled in BC.

Reference

1. CFIA-04&05-2018. Food Recall Warnings - High Risk. Government of Canada <http://inspection.gc.ca/about-the-cfia/newsroom/food-recall-warnings/eng/1299076382077/1299076493846> (accessed May 29, 2018).

Toxic exposure mediated via FOOD in BC (I) – BCTOX-RA®

Marine biotoxins (2017) in BC - Data from CFIA – BCTOX graphs

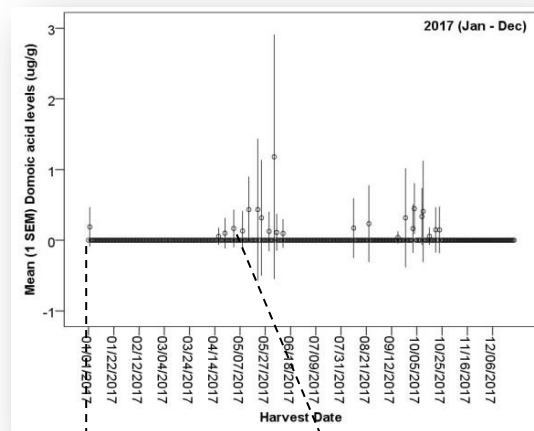
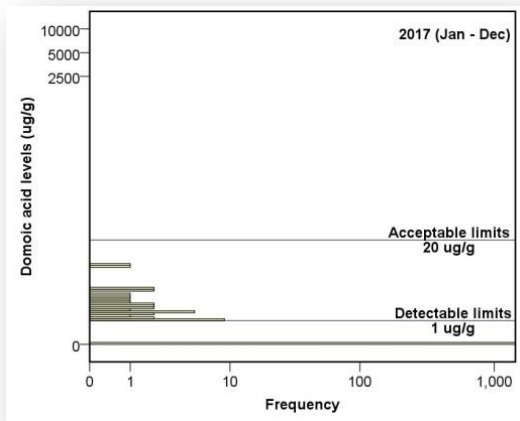
Frequency

Mean (1 SEM) concentrations

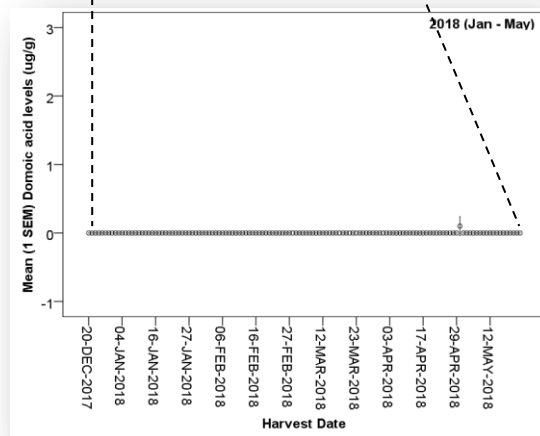
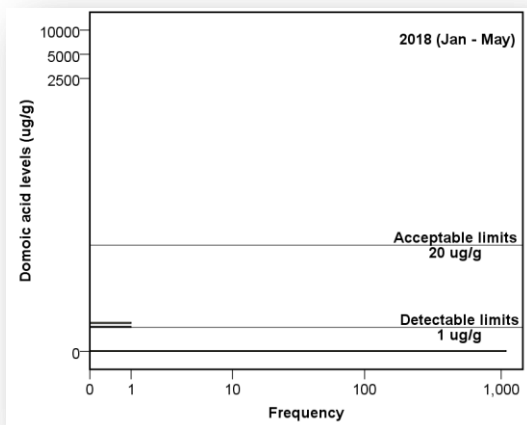
1- Domoic acid

Domoic acid (ug/g) (Amnesic shellfish poisoning (ASP)) among detected shellfish samples in BC (January to December 2017) (n=2 positive cases out of 1088 samples) [These graphs are prepared to imply the trend, and it should be interpreted with caution]

2017 (Jan to Dec)



2018 (Jan to May)



Bi weekly marine bio-toxin monitoring in West Coast BC from Jan to May 2018

✓ **Below** regulatory limits Domoic acid [Amnesic Shellfish Poisoning] are rarely reported. No cases of above regulatory limits were reported. As compared to Jan to May 2017, the values seem to be lower.

Toxic exposure mediated via FOOD in BC (I) – BCTOX-RA®

Marine biotoxins (2017) in BC - Data from CFIA – BCTOX graphs

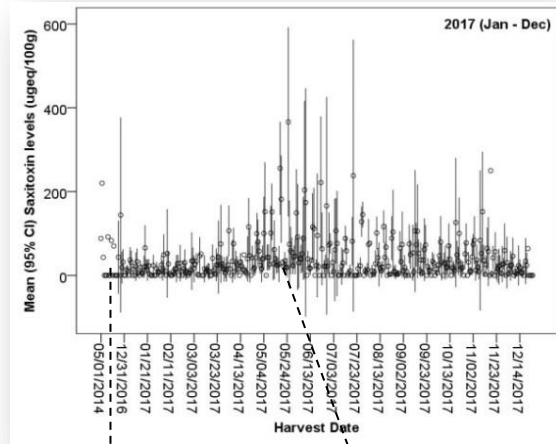
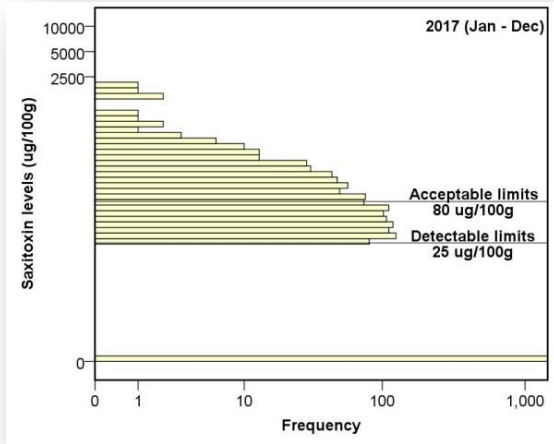
Frequency

Mean (1 SEM) concentrations

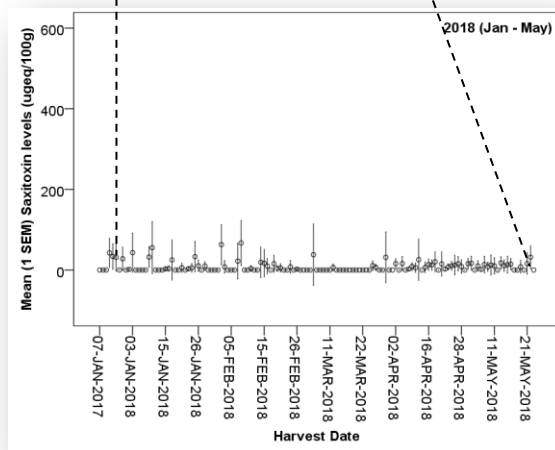
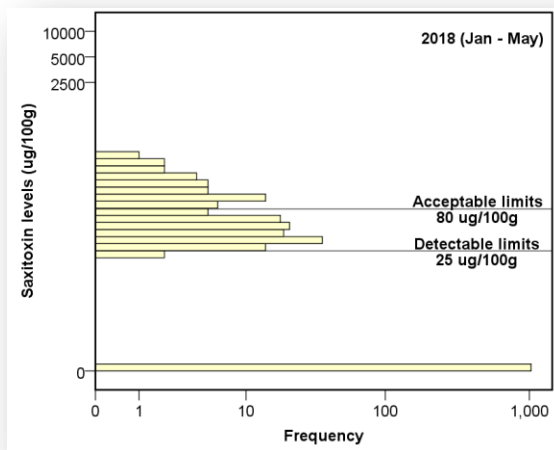
2- Saxitoxin

Saxitoxin (ug/100g) (Paralytic shellfish poisoning (PSP) among detected shellfish samples in BC (January to December 2017) (n=154 detected and 20 above the regulatory limit out of 1181 samples) [These graphs are prepared to imply the trend, and it should be interpreted with caution]

2017 (Jan to Dec)



2018 (Jan to May)



Bi weekly marine bio-toxin monitoring in West Coast BC from Jan to May 2018

✓ Above regulatory limits of Saxitoxin [Paralytic shellfish poisoning] concentrations were reported in 2018. The extent of the problem seems to be lower than 2017.

Toxic exposure mediated via FOOD in BC (I) – BCTOX-RA®

Marine biotoxins (2017) in BC - Data from CFIA – BCTOX graphs

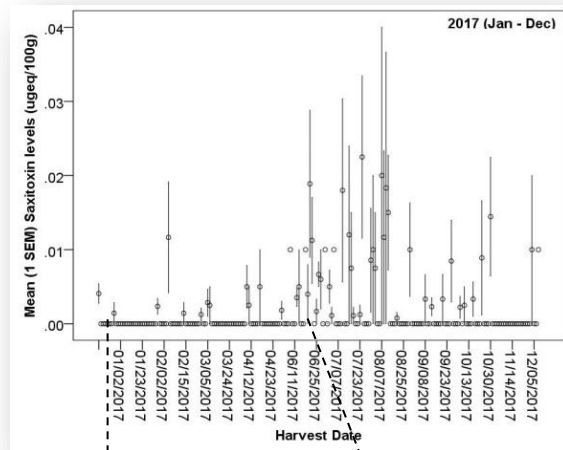
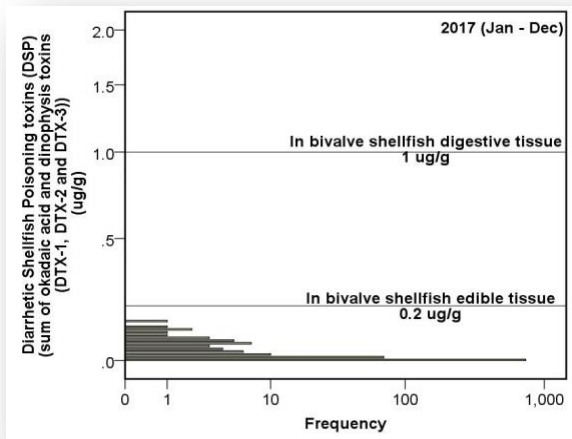
Frequency

Mean (1 SEM) concentrations

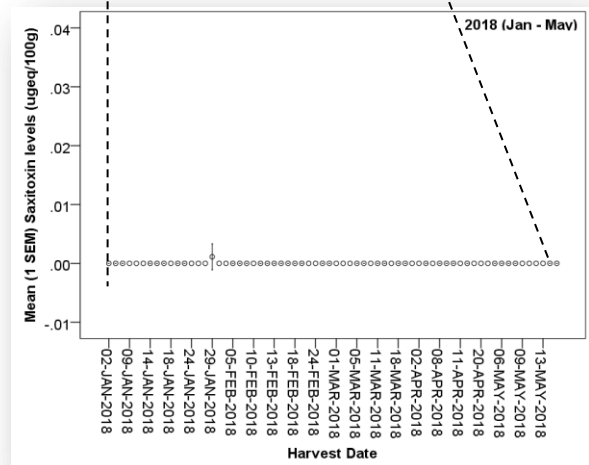
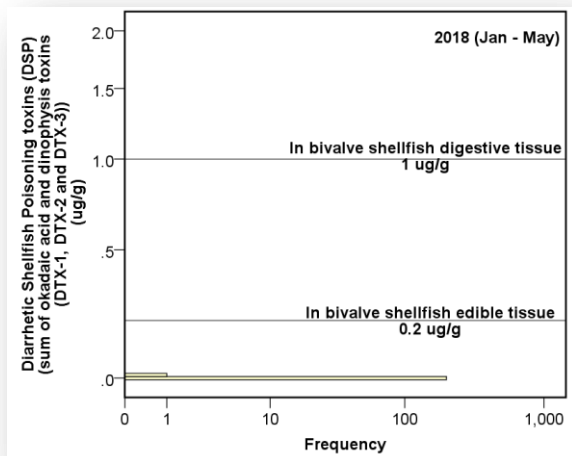
3- Okadaic acid

Okadaic acid (sum of okadaic acid and dinophysis toxins (DTX-1, DTX-2 and DTX-3) (Diarrhetic Shellfish Poisoning toxins (DSP)) among shellfish samples in BC (January to December 2017) (n=114 detected out of 735 sample) [These graphs are prepared to imply the trend, and it should be interpreted with caution]

2017 (Jan to Dec)



2018 (Jan to May)



Bi weekly marine bio-toxin monitoring in West Coast BC from Jan to May 2018

✓ Below regulatory limits of Okadaic acid and dinophysis toxins [Diarrhetic Shellfish Poisoning] were reported a couple of times. The extent is even lower than the last year.

Other Marine Miotoxins

Cyanobacterial toxins

No report of cyanobacterial toxins were detected in media until 29th of May 2018 in BC.

Decision Tree for Drinking Water: Cyanobacterial Toxins – Step Descriptions (No information is available online from BC)

STEP A: STEP A: Initial screening for suspected blooms: Examine the water for one or more of total nitrogen and phosphorus. Check for bloom formation.

STEP B: If yes to any of: nitrogen (N)>658 µg/L; phosphorus (P)> 26µg/L; an N:P ratio < 23; changes in secchi depth; or blooms observed, go to Step C. If no, return to Step A.

STEP C: Sample the raw water. Use a portable field kit to test for the presence of microcystins.

STEP D: If the presence of microcystins is detected (>1.0µg/L) with a field test kit, go to step E, and alert the health authority of a potential issue. If microcystins are absent, return to step A.

STEP E: Use a portable test kit to test the treated water supply for microcystins.

STEP F: If the portable test kit indicates microcystins are present (>1.0µg/L) in the treated water, send a sample to the lab for confirmation and immediately notify the health authority.

STEP G: If the lab results indicate the seasonal MAC of 1.5µg/L has been exceeded, immediately contact the health authority for consultation and decision making.

Azaspiracid and analogues (No information is available online from BC)

Brevetoxin and analogues (No information is available online from BC)

Cyclic imines (No information is available online from BC)

Palytoxin and analogues (No information is available online from BC)

Pectenotoxin (No information is available online from BC)

Tetrodotoxin and analogues (No information is available online from BC)

Yessotoxin and analogues (No information is available online from BC)

.Toxic exposure mediated via WATER in BC

Norovirus outbreaks linked to BC oysters is a sign of water pollution

Sewage treatment practices, the quality of septic systems and illegal dumping from vessels are all areas where Winterburn said improvements could be made that would prevent contamination and better preserve the marine environment.¹

[\(Read more\)](#)

Microplastics and shellfish industry in BC

Based on a new study microplastics found at 16 sites that were tested in the Baynes Sound and Lambert Channel areas, which are home to about 50 per cent of the province's shellfish farms.--- Investigators are looking for a zero tolerance policy for plastics getting into its waters, given a growing awareness about their impact on marine ecosystems.²

Toxic Spills/Dumps

What were the significant reported spill incidents in BC in March?³

“Significant spills” reported by Spill Incidents [oil or hazardous material] in BC are as follows. Further information click on each item. (accessed March 27, 2018)

Date	Name	Source	Nearest Community	Spilled Content
2018-05-04	Goldstream Motor Vehicle Incident	Motor Vehicle Incident	Langford	Possible Furnace Oil
2018-05-09	Gas line struck in Pitt Meadows	Gas Line	Pitt Meadows	Natural Gas
2018-04-11	Fuel truck spill - Mile 543 Alaska Hwy	Transport Truck	Watson Lake, Yukon	Fuel
2018-04-09	Sinking fishing vessel near Prince Rupert	Vessel	Prince Rupert	Unkno wn

[\(Read more\)](#)

Environmental Emergency Contacts

Environmental Emergencies in BC

24-hour/toll-free: 1-800-663-3456

Marine Spills in International Waters

24-hour/toll-free: 1-800-OILS-911

Marine Pollution in Canadian Waters

Toll-free: 1-800-889-8852

Toxic exposure mediated via SOIL in BC

Kinder Morgan oil spill in BC

Kinder Morgan temporarily turned off its Trans Mountain pipeline for several hours yesterday, after a small oil spill at its Darfield station north of Kamloops.^{4,5}

In this accident, about 100 litres of crude had spilled from Kinder Morgan's Darfield pump station on May 27, 2018 according to a spokesperson from B.C.'s environment ministry.⁶

[\(Read more\)](#)

Toxic exposure mediated via SOIL in BC

By Tissa Rahim

Japanese beetle infestation in downtown Vancouver leads to restrictions in gardening and waste disposal

Since last year, almost 1,000 Japanese beetles have been found in downtown Vancouver. Of those, 90% were found in David Lam Park. These beetles feed on plants causing the plant to die, and can result in the destruction of agricultural crops. Plans have been put in place to keep the beetles contained and prevent the potentially devastating effect on Fraser Valley farms. These plans have been put in place in neighbourhoods including False Creek, Chinatown and Mount Pleasant and include bans on removing plants and soil and yard trimmings without permission from the Canadian Food Inspection Agency. Yard trimmings can still be placed into green bins. Larvacide spray will also be used around the locations the beetle was spotted beginning in June. The larvacide, Acelepryn, was chosen because it will not impact other animals or insects. Staff will be on hand during spraying to answer any related questions. Spraying is expected to take three to four weeks and will cover about 19 hectares.⁷




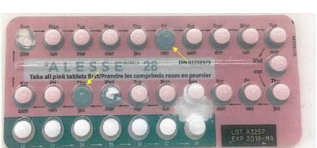

[\(Read more\)](#)

References

1. CBCNews-2018-05-04. Norovirus outbreaks linked to B.C. oysters a sign of water pollution, says shellfish group. <http://www.cbc.ca/news/canada/british-columbia/norovirus-oysters-april-2018-1.4649715> (accessed May 19, 2018).
2. CTVNews-2018-05-23. Research needed on impact of microplastics on B.C. shellfish industry: study. <https://www.ctvnews.ca/business/research-needed-on-impact-of-microplastics-on-b-c-shellfish-industry-study-1.3942127> (accessed May 29, 2018).
3. Spill-Incidents. Province of British Columbia. <http://www2.gov.bc.ca/gov/content/environment/air-land-water/spills-environmental-emergencies/spill-incidents> (accessed 29, 2018).
4. GlobalNews-2018-05-28. The Morning Show May 28 2018 8:12am 00:30 Crews cleaning up after Kinder Morgan oil spill in BC. <https://globalnews.ca/video/4235874/crews-cleaning-up-after-kinder-morgan-oil-spill-in-bc> (accessed May 24, 2018).
5. Castanet-2018-05-28. Small spill on Trans Mtn. <http://www.castanet.net/edition/news-story-227331-3-.htm> (accessed May 29, 2018).
6. CBCNews-2018-05-27. Trans Mountain pipeline shut down after spill in Darfield, B.C. <https://bc.ctvnews.ca/trans-mountain-pipeline-shut-down-after-spill-in-darfield-b-c-1.3947420> (accessed May 29, 2018).
7. CBCNews-2018-05-24. 'We are very worried about it escaping the area': Vancouver launches a battle against the Japanese beetle. <http://www.cbc.ca/news/canada/british-columbia/japanese-beetle-battle-vancouver-regulated-area-spraying-1.4676879> (accessed May 29, 2018).

BCTOX's Toxicology Surveillance in BC (v)
Toxic Exposure Mediated via PRODUCTS – April and May 2018 (selected items)

Selected Toxicological related product recalls / alerts ¹ - Updated 2018-03-26

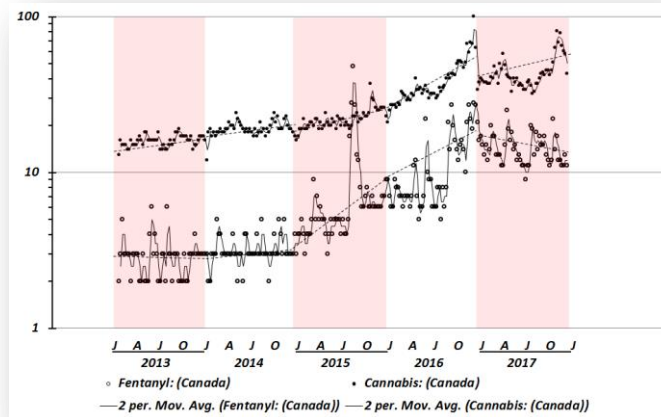
Date	Items --- Reasons to recall	Photos
2018-05-19	Advisory Unauthorized Botox and other health products seized from Arshia Hair Salon and Spa in <u>Toronto</u> May Pose Serious Health Risks (Read more)	
2018-05-18	Unauthorized prescription antibiotic drugs seized from Gigi's Market in <u>Ottawa, ON</u> (Read more)	
2018-05-03	Erfa-Tranexamic 100 mg/mL (5 ml) due to Presence of particles in affected lots (Read more)	
2017-04-30	Foreign Product Alert: 7 Days Slim hip & Legs caps, CA NI CAP Arm Slim, Perfect Slim by Peenuch capsules, Slim Perfect Legs, Ure Tonic Herbal Traditional (Read more)	 Perfect Slim by Peenuch capsules Slim Perfect Legs
2017-04-20	OraVerse Injection due to out of specification for phentolamine mesylate assay in lot D01894D. Out of trend for degradation product impurity (phentolamide) in lots D01894D and D01894F. (Read more)	
2017-04-18	Bortezomib for Injection Potential for presence of particulate matter (glass) in affected lot. (Read more)	
2017-04-16	Women taking birth control pills reminded to return any packages for replacement if the pills are missing or look unusual. (Read more)	
2017-04-05	APO-AMOXI PWR FOR SUSP 125MG/5ML (Read more)	
2017-04-06	Two lots of the epilepsy drug Primidone recalled because of high levels of lead, which may pose serious health risks (Read more)	

Reference

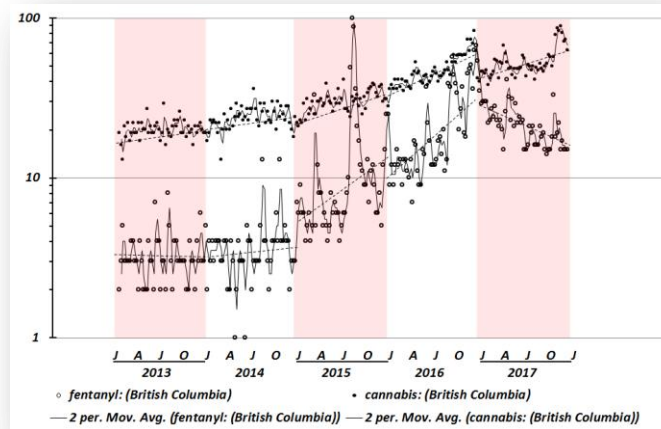
1 Recalls-and-safety-alerts. Recent health products recalls and alerts. Health. http://www.healthycanadians.gc.ca/recall-alert-rappel-avis/index-eng.php?cat=3&_ga=2.98691166.150723310.1501627009-1385356855.1486499691

BCTOX's Toxicology Surveillance in BC

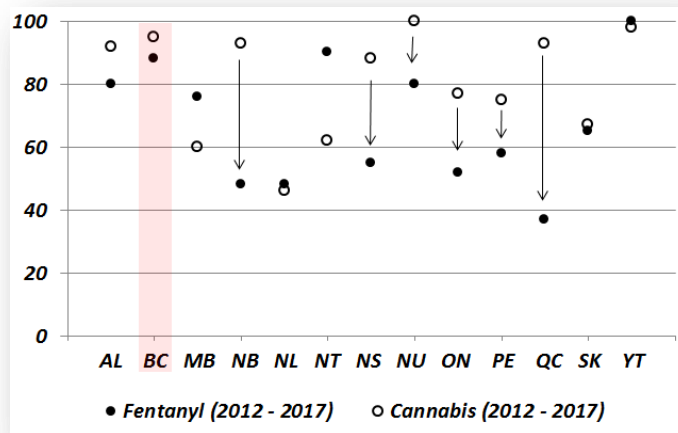
Shifting public interest – Comparison of Fentanyl and Cannabis - 2013-2017



Shifting public interest (2013 to 2017) for the whole Canada. Data points are relative to the maximum search in two week periods. As can be seen, in recent months public searches for *fentanyl* decreased and for *cannabis* increased. These could be related to the fact that we are approaching the date of legalization of *cannabis* in the country.



Shifting public interest (2013 to 2017) for British Columbia. Data points are relative to the maximum search in two week periods. As can be seen, in recent months public searches for *fentanyl* decreased and for *cannabis* increased. These could be related to the fact that we are approaching the date of legalization of *cannabis* in the country. The number of deaths regarding fentanyl overdose has also decreased in recent months in the Province.



Comparing public interest in different Provinces (2012 – 2017). [Figures are relative to the maximum search in two week period] In general, searching for Cannabis was higher in majority of provinces but Manitoba and Northwest Territory.

BCTOX's Toxicology Surveillance in BC

Shifting public interest - Fentanyl, Heroin, Cocaine and Cannabis - 2017 alone

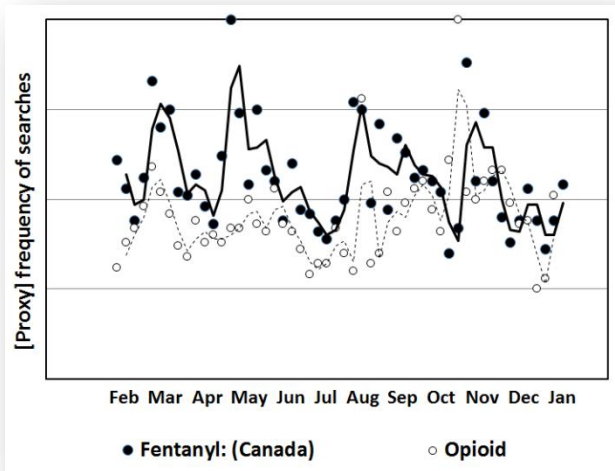
BCTOX is reporting the trends of public interest (Public-&Professional searches) for major toxicology related issues in BC as a new surveillance system using google trends as surrogates of public attitude. The following graphs show the proxy frequency of searches for the keywords from Feb 2017 to Jan 2018. Each variable is compared with itself (the highest frequency of searches over a two week period in 2017 serves as the baseline (highest)). As just the trends (but not the actual numbers) are important and feasible, no values are given for the vertical axis. --- For clarity of the message, the regression lines are presented as moving averages with period of 2.

As can be seen, the public relative interests in "fentanyl" as compared to search term "opioids" are similarly shifted in both Canada and BC (figure A -1 and A-2)[left side].

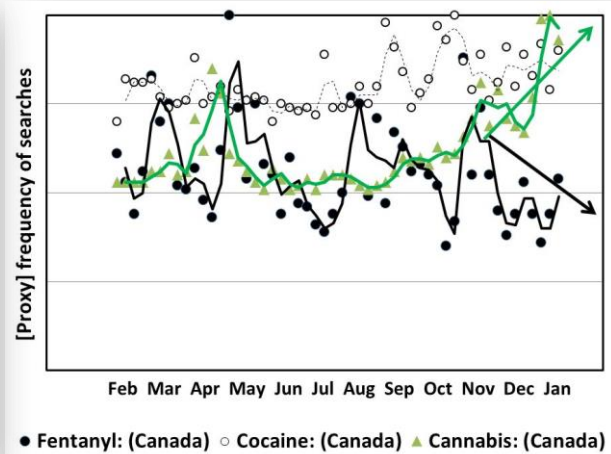
These findings are also not consistent when fentanyl searches are compared to "cannabis" and "cocaine" (figure B-1 and B-2)[right side]. This is despite the fact that fentanyl overdose induced deaths have remained relatively high, and as we are approaching the cannabis legalization.

This finding has public health relevance in the province. Measures should be taken to keep engaged public (or avoid social fatigue) regarding the relative importance of "fentanyl" and in the influence of the process of Cannabis legalization.

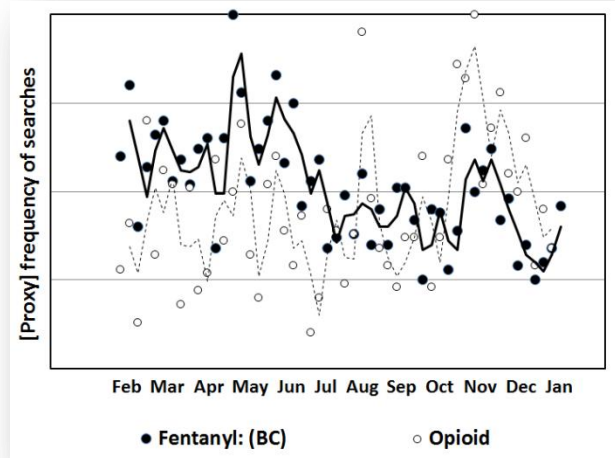
--- Public searches for "fentanyl" (Fu-F) (less potent) and carfentanyl (more potent) analogs of fentanyl were not included.



A-1. Canada

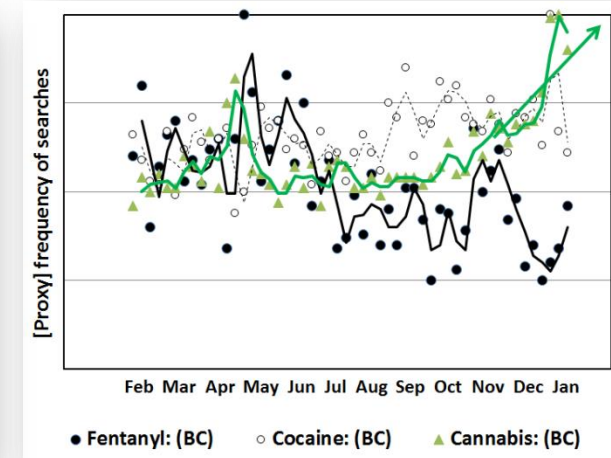


B-1. Canada



A-2. British Columbia

"Fentanyl" public searches as compared to "opioids" as a whole (Past 12 month to Jan 22, 2018)



B-2. British Columbia

"Fentanyl" public searches as compared to "Cannabis" and "Cocaine" (Past 12 month to Jan 22, 2018)

BCTOX's Toxicology Surveillance in BC

Shifting public interest - CO, Mushroom, Plant, bites, and air, water, soil and food poisoning or pollution - 2017

Figure C shows that public was more concern of carbon monoxide poisoning during colder months of the year.

Figure D suggests that public searches start earlier for plant poisoning as compared to bites and stings followed by mushroom. "Plant" and Mushroom" was used as surrogates for "plant poisoning" and "mushroom poisoning".

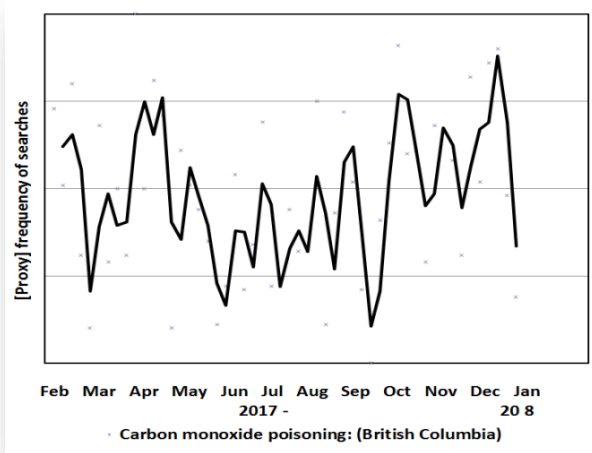


Fig C. Public interest in carbon monoxide poisoning during the past 12 months) (frequency of searches from Feb 2017 to Jan 2018)

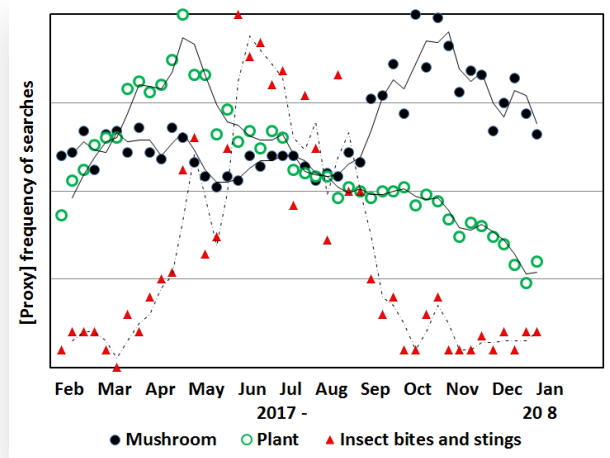
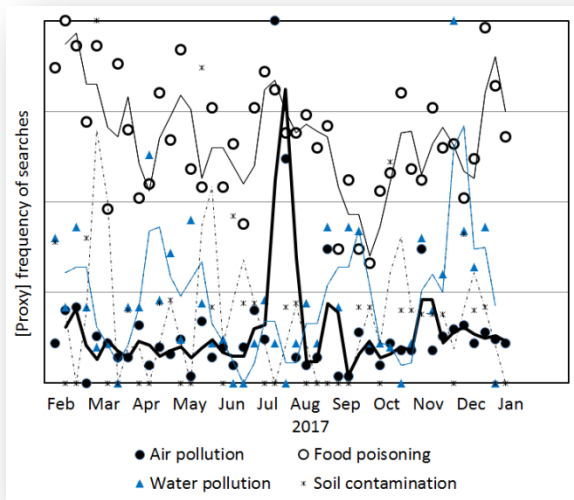


Fig D. Public interest in "Bites or stings" as compared to "plants" and "mushroom" (frequency of searches from Feb 2017 to Jan 2018)



The pattern of public interest for "air pollution" was disrupted in July and August, which coincide with forest wildfires (figure E).

Fig E. "Air pollution" as compared to other routes of exposure to contaminants (frequency of searches from Feb 2017 to Jan 2018)

Popularising the Science of Toxicology by Reza Afshari

Mithridatium (Universal Antidote), Mithridatism and Mad Honey Chemical Warfare

Solve the mystery:

- What could be the potential medicine or chemical that Mithridates used to immunize himself?
- What mechanisms can you suggest?

Take a guess (or confirm the given diagnosis), and email in your response to be entered into the BCTOX drawing for a \$20 gift card (Deadline: May 10, 2018).

- If you send just a diagnosis, you will be entered once.
- If you send the justification of your diagnosis, you will be entered twice.

--- There is no right or wrong answer for this competition. You may select a given diagnosis or provide a new one.

Mithridates VI (Mehrdad IV)

Mithridates VI or Mehrdad VI "Persian; gift of Mithra" was the king of Pontus (in eastern modern Turkey), Persia and Greece from 113[?]-63 BCE. He claimed descent from Persian Cyrus and Darius the Great, and Regent Antipater, a Greek-Macedonian general.

Mithridates VI saw himself as bridging the East and West together and as the defender of the East against Roman domination.[1] --- At the same time, another King, Mithridates II reigned (121 – 91 BCE) Persia and Babylon (modern Iran and Iraq), and claimed descent from Cyrus the Great.

Mithridates VI and Mithridates II were Zoroastrian kings, but were highly influenced by Greek culture, which is clear from their coins written in Greek. The latter is more well-known, as he concurred Babylon, but is not the topic of interest within this article.



Mithridates VI – Scheme is based on his silver coin. YA[®]

Mithridates VI's life was like a fairy tale. His father, Mithridates V, was allegedly poisoned by his mother, queen Laodice VI, in 120 BC. His mother favored his brother, and during his teenage years Mithridates VI was forced to escape and go into hiding from a plot planned by the queen. He eventually claimed the kingdom as his own, imprisoned his competitor brother, and his mother to death.

He was a visionary rebel with charisma and determination. However, he'd been thought to be ruthless, strange and suspicious by everyone throughout his entire life. He even married his younger sister in an attempt to "preserve the purity of his bloodline" and legitimise his children for succession. And in autumn of 88 BCE, he massacred more than 80,000 civilians, of which majority were Roman.[2]

He was also an erudite patron of science, particularly concerned with poisons and antidotes.[3] He often displayed his life-long arrogance by bragging about his immunity to poisons through invitations to guests to eat his food and drinks concocted with deadly substances. Mithridates VI inspired Mozart's first opera, and Machiavelli has praised his military genius.

For over 50 years, he fought the Romans several times as their most resilient enemy in the, so called "Mithridatic Wars". Eventually he was defeated, and escaped to Crimea. In attempt to avoid being captured by the Romans, he attempted to commit suicide by poison; unsurprisingly, he failed. Two of his daughters even ingested the poison and died soon after.¹ Poisons seemed ineffective at killing Mithridates VI, and eventually, at his request, his loyal friend, Bituitus, ended his life by sword.

Toxicological breakthroughs by Mithridates VI

Although underappreciated; Mithridates IV is the pioneer of clinical toxicology,[4] [5] and is suggested to be the father of "empirical toxicology".[6]

➤ He is recognized for:

- ✓ Testing poisons on condemned criminals.[1]
- ✓ Developing a 'universal antidote' or "Mithridatium"[5], which was later named "theriaca".
- ✓ Establishing Mithridatism, which is a long standing school of thinking in clinical toxicology, defined as "tolerance to a poison acquired by taking gradually increased doses of it".[7]
- ✓ Using grayanotoxin-containing honey, or mad honey, in 67 BCE against the troops of Pompey the Great, which is the first recorded use of a biotoxin in warfare.[6] He developed a tactical retreat leaving mad honey, containing honey combs, in the path. The Roman troops who consumed the honey were later treated easily.[8] Mithridates IV's soldier also used poisoned arrows dipped in snake venom to cut down masses of legionaries, and stinging hornets and slaving bears to attack the Romans.[2]

Mad Honey (Grayanotoxin) Poisoning

Certain plants of the Ericaceae family, including the Rhododendron, Pieris, Agarista and Kalmia, contain diterpene grayanotoxins. Consuming these plants causes dizziness, hypotension and atrioventricular block. [9]

Grayanotoxins can also be consumed by honey bees and, subsequently, concentrated in honey. Mad honey is purchased by lay individuals even today for its alleged effects on sexual performance.[10] [11]

Grayanotoxin causes cholinergic toxidrome resulting in an altered mental state and incapacitating bradycardia, hypotension, myocardial infarction,[12] nausea, vomiting,[11] hypothermia[13] and death or so called mad honey poisoning. [8] Symptoms are experimentally imitated in human. [14]

Mithridatism

As previously mentioned, Mithridatism is defined as "tolerance to a poison acquired by taking gradually increased doses of it".[7] It is postulated that poisons can be *beneficial*, as well as *lethal*.

Mithridates IV frequently experienced, and was always suspicious of, treachery. To protect himself, he continuously consumed small doses of poison in increasingly greater amounts in order to build up tolerance. And eventually, Mithridates IV attempted suicide by poison and failed. Thus, it is unclear whether his practice was successful, but at least it may have deterred others from attempting to poison him.

¹ Mithridates' life, reign and death have been portrayed differently by the Romans, Greek and Persians.

Mithridatism - Potential poisons that Mithridates used to immune himself

Although historically and scientifically highly controversial, Mithridates VI's immunity to poisons is documented to be related to:

- Increasing doses of *snake venom*[15] or flesh of vipers.[5]
- Frequent doses of *arsenic* by ingesting tiny amounts over many years.
- A mixture of the *blood of Pontic ducks, whose flesh was toxic from their ingestion of plants poisonous* to humans, with other substances reputed to 'expel' poisons.[3]
- A mixture of over 50 ingredients, consisting of poison counteracting 'drugs[?]'.[1]
- **Snake venom**

Science has proven that peptide venoms, such as snake venom, are disabled in the gastrointestinal system and are ineffective on intact stomachs and intestines. Therefore, snake venom would be ineffective. This fact can be experimentally proven easily, particularly since he was performing experiments on condemned criminals. Thus, although ineffective, he may have knowingly ingested snake venom in his lavish ceremonies as a dramatic display of his power.

A single dose of an "orally" ingested poison that "rapidly" killed his druthers indicates that poison was not a peptide, like snake venom.[3]

➤ Arsenic

Arsenic was a commonly used poison during Mithridates era, so it is plausible that he used it in an increasing matter. Rat studies have shown that pre exposure to arsenic may magnify certain mechanisms of actions in detoxifying poisons; a finding which is controversial, dangerous and counterproductive.

Upregulation of glycolysis and oxidative phosphorylation,[16] erythrocyte antioxidant defense systems and lipid peroxidation,[17] indirect and direct inhibition of glutathione reductase leading to apoptosis, [18] oxidative stress in the liver [19], etc. are reported as a result of sub-chronic or chronic exposure to low doses of arsenic. Additionally, low dose arsenic exposure is carcinogenic, however, Mithridates lived long for his era.

➤ Blood of Pontic ducks, whose flesh was toxic from their ingestion of poisonous plants

Set aside the complexity of this innovative experiment, it is scientifically plausible that ingested poisons, or their metabolites, would end up in the bloodstream. Moreover, as the duck survived the experiment, the dose would not have been high.

Mithridatism and immunology[20] - Vaccination

Mithridates VI's practices, including alleged increases of small doses of snake venom, also make him a forerunner of Immunology[20] [21] and vaccinations.

Immunotherapy (also called desensitization or hyposensitization) is the treatment of diseases by inducing, enhancing, or suppressing an immune response. For example, immunotherapy can reduce sensitivity to allergens and lessen their severity through the "administration of slowly increasing doses of a specifically relevant allergen in the treatment of IgE-mediated allergic diseases, until a maintenance dosage is achieved or the patient is free of symptoms".[21]

The human immune system can learn to produce antibodies against antigens that are commonly used in vaccines. Additionally, early exposures may explain the reason that peanut and non-food allergies are relatively less common in Canadians of Asian descent [22]

Mithridatism is effective with complex biological poisons, such as wasp stings. However, having said that, immunotherapy could not explain

Mithridates' immunity towards other poisons, like chemicals. A more plausible explanation for his experience would be a toxicological mechanism.



Furthest extent of Mithridates VI Empire. Scheme based on a map from. [2]

Mithridatism and toxicology

The mode of action for Mithridatism could be explained by activation of the immune system or by mechanistic pathways of functional biotransformation (detoxification). Hepatic enzyme induction, including auto-induction, is well recognised in the use of long-term medications.

Certain medications including alcohol enhance the number of enzymes, including microsomal and mitochondrial CYPs. CYPs can be found in almost any tissue, such as the liver, kidney, lungs and brain, and play an important role in the intra-cellular metabolism of drugs and xenobiotics.

If that happens, larger doses of the same medication/chemical or shorter intervals of use are needed to have a similar effect. Increased doses of alcohol in heavy drinkers is a well known example of this phenomenon.

Enzyme induction could provide a more suitable explanation than immunologic mechanisms for Mithridatism. (see under arsenic for more information)

Mithridatism and Homeopathy

Mithridatism may have also influenced the development of "Homeopathy". Homeopathy, or like cures, was introduced by Samuel Hahnemann in 1767, and is highly controversial. In this school of thinking, chemicals that may cause a particular symptom are considered to be a cure for the same symptom that is caused in a particular disease. To use the chemical, it should be diluted to extremely low concentrations, or perhaps to zero concentration. To date no well-established research has supported homeopathy.

Question

What do you think? What could be the potential medicine or chemical that Mithridates used to immunize himself? What mechanisms would you suggest?

Take a guess, and email back your response to be entered in the BCTOX drawing for \$20 gift card. --- There is no right or wrong answer for this competition. You may select a given diagnosis or provide a new one.

(Deadline June 10, 2018)

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Announcements

World No Tobacco Day, 31 May 2018



"Every year, on 31 May, WHO and partners mark World No Tobacco Day (WNTD), highlighting the health and other risks associated with tobacco use, and advocating for effective policies to reduce tobacco consumption.

The focus of World No Tobacco Day 2018 is "Tobacco and heart disease." The campaign will increase awareness on the:

link between tobacco and heart and other cardiovascular diseases (CVD), including stroke, which combined are the world's leading causes of death;

feasible actions and measures that key audiences, including governments and the public, can take to reduce the risks to heart health posed by tobacco."

What do you plan to do for stopping this most toxic and lethal exposure exposure?

[\(Read more\)](#)

Vancouver Mycological Society



Annual General Meeting of Vancouver Mycological Society organised on Tuesday April 10th.

<https://www.vanmyco.org/>

International Overdose Awareness Day



International Overdose Awareness Day is being held in various BC locations on August 31st, 2018, until 3PM. This day is aimed to raise overdose awareness via community outreach and education.

It also brings together those who have lost loved ones to fatal overdoses. Training on naloxone administration will also be provided at some sites.

[\(Read more\)](#)

Cannabis & Hemp Science Seminar Series-Vancouver



This conference on the cannabis growing, testing and manufacturing industry in Canada aims to bring together various stakeholders including industry, government and scientists.

Friday, June 15: 8:00AM - 6:00PM, Jack Poole Hall University of British Columbia

[\(Read more\)](#)

ToxNow Podcast



Episode 41 *Kratom: Friend or Foe* (by Matt Z, released April 7, 2018)

To listen: <http://toxnow.org/>

A discussion with medical toxicologist Ed Boyer about Kratom and his recent article published in "Addiction"

[\(Read more\)](#)

Stop Overdose Surrey: Connection Saves Lives Event



A series of free events happening across Surrey:

- April 30: City Centre Library, 10350 University Drive
 - May 7: Shannon Hall, Cloverdale Rodeo Grounds, 6050a 176 Street
 - May 23: White Rock Community Centre, 15154 Russell Avenue
- From 5:30-7:30PM

Topics covered will include reducing stigma and isolation and fostering compassion around the overdose crisis.

[\(Read more\)](#)

Upcoming Toxicology jobs in BC, May 2018

[UBC](#); Current Job Postings

[LifeLabs Supervisor, Lab Ops](#)

[Golder, Junior Environmental Scientist](#)

[Evonik, Research Associate](#)