BCTOX

BC Toxicology News Monthly Bulletin

Monthly / Vol. 2 /No. 11 / Pages 158 – 175 November - 2017

Keep Engaged with Toxicology News in BC

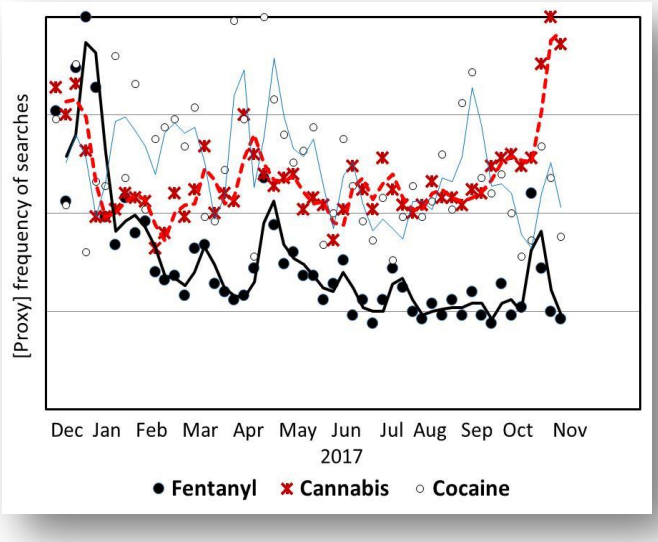
Contents

BCTOX is now shared with over 300 professionals in BC. It can increase your works' visibility!

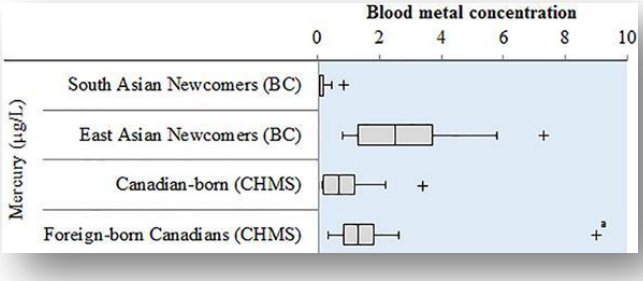
You may contribute to BCTOX by providing 500 word abstracts of a toxicology related problem or an initiative that you have taken!

These "Abstracts" of BCTOX are peer reviewed and referenceable. How to cite abstracts of the current issue? Authors' surname, Initials, Title. *BCTOX* 2017; 2(11): Pages.

BC Toxicology Pictures of the Month



British Columbian's are losing their relative interest in "Fentanyl" as compared to "Cannabis" and "Cocaine" according to BCTOX surveillance system. [See page 170]



East Asian newcomer women of reproductive age in Vancouver have a higher level of blood mercury. Levels adopted from (Dix-Cooper and Kosatsky 2018) [see page 162]

About Us

Aims and Scope

BC Toxicology News Monthly Bulletin (BCTOX) aims to popularise the knowledge of toxicology and expand use and the awareness of Toxicology News in British Columbia, Canada. It tries to engage health and environmental professionals with online published toxicology news, publicly available information, and by providing short communications. BCTOX mainly focuses on adapting or summarizing relevant toxicology news in BC. The Bulletin accepts and welcomes contributions from professionals and the public as long as they meet BCTOX standards.

How to access the original news items? If you click on the link related to each one of the provided stories, it will take you to the original site of the news.

Publication Frequency: BCTOX is published monthly in English by Reza Afshari.

Provided information in GRAY is not related to the current issue, but could be of interest.

ISSN: 2560-645X

Policies:

Open Access Policy: This bulletin provides open access to all its content.

***Fee*:** BCTOX is free-of-charge for readers and contributors.

Copyright Statement

BCTOX's content is currently prepared by Reza Afshari. The bulletin retains the copyright of their articles and will be able to archive pre-print, post-print, and publisher's versions.

This bulletin is not official and for the most parts is not peer-reviewed. It does not cover all the news, and is not liable for the accuracy of the news from media. It is, however, BC related, informative, handpicked and fun to read. The provided contents are not necessarily BCTOX's views.

BCTOX has been modified since (BCTOX 2017 June 2(6)) issue. It is now accepting 400 words educational material, commentaries, and research abstracts (with data) as long as they are within the scope of the bulletin and meets our standards. We are going to publish up to four short [but not full papers] abstracts in each issue. This section of the journal is peer reviewed.

Archiving. Digital Archiving: In addition to indexing database this Bulletin utilizes digital archive as well as hard copies to guarantee long-term preservation and restoration.

Publication Ethics

This bulletin follows International Committee of Medical Journal Editors (ICMJE)'s Recommendations. Authors (i) must declare any conflict of interest in a given manuscript, and we utilize COPE workflow to transparently handle it, (ii) follow ICMJE definition of author and contribution, and (iii) accept the ethical policy including regulation and malpractice statement.

Guide for Authors

From June 2017 (BCTOX 2017 2(6)) we publish original research, mini reviews, short communications, letters, case reports, and case series as long as they are limited to 400 words and the content is British Columbia related. These publications are peer reviewed.

References

References should be given in the Vancouver style and numbered consecutively in the order which they are first mentioned in the text. Citation in the text should be in line with text in parenthesis with Arabic numbering style.

List of contributors of this issue

Reza *Afshari*; Editor-in-Chief
Yasi *Afshari;* Information gathering
Karen *Bartlett*; Short article
Michael *Jonasson*; Editor of English language
Tissa *Rahim*; Toxicology of Soil

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

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BCTOX does not have a professional website yet, but materials could be found from https://plus.google.com/105713713266879554108

Google Scholar https://scholar.google.ca/citations?user=uaHeNh8AAAAJ&hl=en

New subscribers will be added to the mailing list upon their request.

If this bulletin is not of interest to you, let us know please so we do not to fill up your mailbox in future.

Toxicology news in this month was focused on Wildfire and Fentanyl overdose, followed by food recall and drinking water quality.

How to cite BCTOX's articles:

AUTHOURS. TITLE, *BCTOX* 2017;2(8): PAGES.

Acknowledgment

BCTOX respectfully acknowledges that it is published on the ancestral homelands of the Coast Salish peoples, including the territories of the xʷməθkwəy̓ əm (Musqueam), Skwxwú7mesh (Squamish), Stó:lō and Səl̓ ílwətaʔ/Selilwitulh (Tsleil-Waututh) Nations.

Erratum from the previous issues None received in September.

Summary of the Toxicology News in BC and Health Authorities in November 2017

Reza Afshari*, Environmental Health Services, BC Centre for Disease Control, BC. Reza.Afshari@bccdc.ca [Editorial 2017-11-30]

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 cope with issues that are locally highlighted in the popular press and news media.

Environmental toxicology training is limited during education, and when HP 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 industry. (Liverman CT, Ingalls CE et al. 1997) All of these factors lead to avoidable confusion.

BCTOX acts as a local up to date resource to answer recent toxicology issues. The business model of BCTOX is flexible in order to maximise the 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.

Major toxicological statistics in August

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

- ACUTE exposures; ≈ 80 due to Illicit drug overdose and around 10 due to suicides (CO, drugs and alcohol), and
- CHRONIC current and past exposures; 500 due to smoking and tobacco use, 81 (air pollution), 11 (radon) and 6 (asbestos). These are equal to overall $15*10^{-5}$ population toxic exposure-induced deaths in October alone, including $2.4*10^{-5}$ acute and $13*10^{-5}$ chronic toxicities (estimations are subjected 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)

Kootenay (Kootenai in US) River watershed

The extent of Selenium release in Kootenay river was disputed this month, and politicians on the other side of border got involved.

TECK company at the BC-US boarder is addressing selenium waste through the use of active water treatment sites.

Hydraulic Fracturing and volatile organic compounds in Northeast BC

Gestational exposure to volatile organic compounds (VOCs) as a result of Hydraulic fracturing for unconventional natural gas exploitation in Northeastern has revealed that:

1- Urinary metabolites of those working in natural gas exploitation are higher than average Canadians
2- First Nation populations are more affected.

Toxic exposures via

AIR

--- None retrieved

PRODUCTS

One brand of Anafranil 10 mg (Clomipramine Hydrochloride), Novamoxin 125mg/5mL (Amoxicillin Trihydrate), Volumizing Eyebrow Gel, Rust Dissolver Gel were recalled from the market (p 149)

FOOD

Bi-weekly marine bio-toxin monitoring on the West Coast of BC from Jan to Nov 2017 showed that

(i) Below regulatory limits Domoic acid [Amnesic Shellfish Poisoning] was mildly reported in the past 2 months, but no case of over regulatory limits.
(ii) Below regulatory limits of Okadaic acid and dinophysis toxins [Diarrhetic Shellfish Poisoning] were still detected in November and
(iii) Above regulatory limits of Saxitoxin [Paralytic shellfish poisoning] were still reported in November, and mildly on the rise. (p 150)

WATER

A few spills with fuel and caustic substances occurred (page 151)

Soil

The Canadian Council of Ministers of the Environment (CCME) has published updated human health and environmental soil quality guidelines for methanol.

Fentanyl crisis; "New normal" or "Not new normal"

The idea that the increased number of deaths due to fentanyl is a "New normal" in BC is under question again due to the fact that the number of opioid overdose deaths is relatively declining.

The general public is losing their interest in Fentanyl! (p 170)

Sola dosis facit venenum

Only the dose makes the poison!

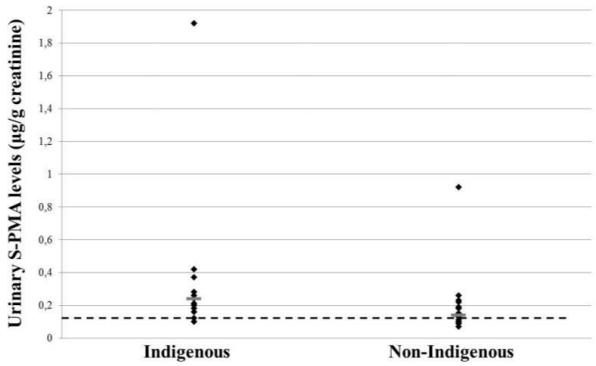
Paracelsus (1493 – 1541 CE)

Summary of the Toxicology News in BC and Health Authorities in September 2017

--- See the rest and details of the news in other sections.

First Nations Health Authority

Gestational exposure to volatile organic compounds (VOCs) as a result of Hydraulic fracturing for unconventional natural gas exploitation in Northeastern BC revealed that:

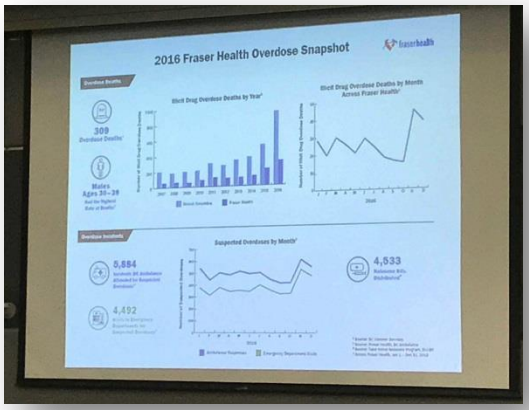


Urinary levels of S-phenylmercapturic acid (S-PMA) (µg/g creatinine) in Northeastern BC were higher than median level in the general Canadian population (CHMS cycle 3) and in particular in Indigenous populations. Adopted from (Caron-Beaudoin, Valter et al. 2018) [Click here]

Fraser Health Authority

Fraser Health promises action to counter opioid crisis

Chilliwack is projected to have 29 deaths from drug overdoses in 2017, up from 12 in 2016. It could soon be getting the Intensive Case Management (ICM) team according to Michael Marchbank, CEO, Fraser Health Authority. (TheChilliwackProgress 2017-11-07)



A snapshot of overdoses and suspected overdoses presented in PowerPoint by Fraser Health.

Interior Health Authority

Report to Council; Nov 6, 2017. Climate change/toxicology related highlights of the report (Report-to-Council 2017-11-06)

COLUMN: Will West Kootenay forests survive? (BCLocalNews 2017-11-18) To read more Click here please.

Kootenay (Kootenai in US) River watershed

Selenium in cross-border waterways

Experts discussed selenium in cross-border waterways Luckily (the BC-US boarder). Teck company is addressing selenium waste through the use of active water treatment sites, and Montana's Department of Environmental Quality states that the water quality standard for selenium has not been exceeded in any state waterway. According to the reports, Montana and the US EPA are stepping up and monitoring the impacts [of selenium] on fish and other aquatic life. (TheFreePress 2017-11-04)

Selenium contamination into the Elk River by Teck [?]

Allegedly, Teck water treatment plant was releasing more toxic forms of selenium into the Elk River watershed, and making the selenium pollution downstream worse. Teck Coal announced plans to shut down their Line Creek water treatment plant. (WildSight 2017-11-20)

A fish with a missing gill plate, a common deformity caused by selenium. Photo adopted from (WildSight 2017-11-20)

Annual selenium loads entering Lake Koocanusa have increased from 2,600 kg in 1992 to 13,000 kg in 2012 (a fivefold increase over the course of 20 years according to U.S. Geological Survey and the State Department of Environmental Quality. A bi-national selenium standard will provide British Columbia's regulatory agencies with better information to establish protective strategies for the lake.(FlatheadBacon 2017-11-06)

Letter to the U.S. Secretary of State

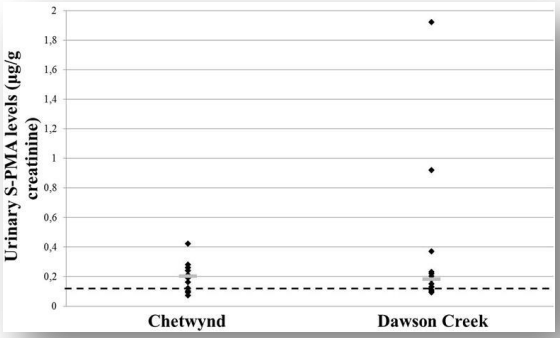
Gov. Steve Bullock and U.S. Sen. Jon Tester, both Montana Democrats, called upon U.S. Secretary of State Rex Tillerson to address the larger bilateral [with Canada] concerns within the Kootenai River watershed, in order to protect Montana's water and to ensure it remains clean for future generations. (FlatheadBacon 2017-11-27)

Report to Council; Nov 6, 2017. Climate change/toxicology related highlights of the report (Report-to-Council 2017-11-06)

COLUMN: Will West Kootenay forests survive? (BCLocalNews 2017-11-18) To read more Click here please.

Northern Health Authority

Gestational exposure to volatile organic compounds (VOCs) as a result of Hydraulic fracturing for unconventional natural gas exploitation in Northeastern revealled that:



Urinary levels of S-phenylmercapturic acid (S-PMA) (µg/g creatinine) in Northeastern BC were higher than median level in the general Canadian population (CHMS cycle 3). Adopted from (Caron-Beaudoin, Valter et al. 2018) [Click here]

Vancouver Coastal Health Authority

Evaluation of blood heavy metals among newcomer South and East Asian women of reproductive age living in Vancouver, Canada showed that

Women from East Asia had higher mercury & cadmium blood concentrations. Mercury concentrations were related to fish consumption, dental amalgams, and traditional remedies, and inversely related to dairy eaters.

Lead blood concentrations detected were low with a positive association with home renovations, cosmetics (e.g. lipstick), and sucking on metal jewelry. (Dix-Cooper and Kosatsky 2018) [click here]

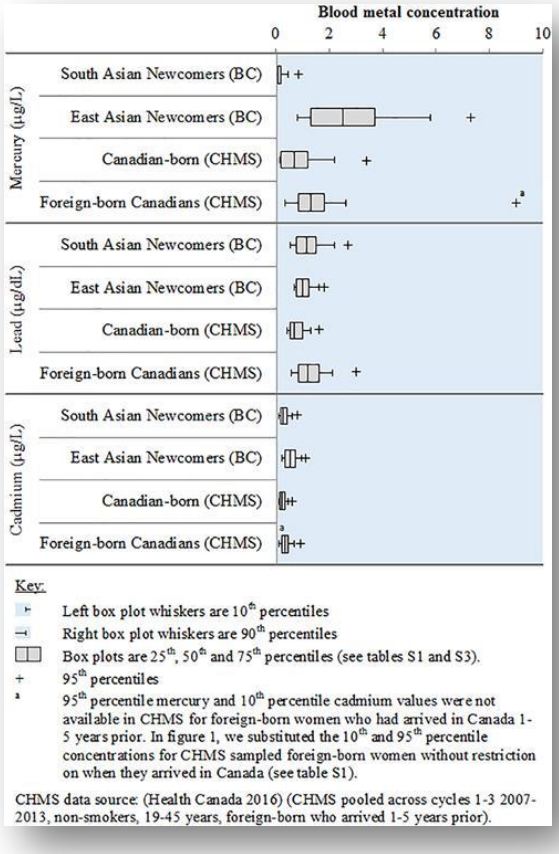


Figure adopted from (Dix-Cooper and Kosatsky 2018)

Vancouver Island Health Authority

Bad Dope!

Cyclopropyl fentanyl, a fentanyl analogue that is related to numerous fatal overdoses in the US was detected in about 7 per cent of fentanyl-positive tests in a week. (TheGlobal&Mail 2017-12-01)

Cheque day, when social-assistance payments are issued in BC is a period that is linked to an increase in overdoses and other related harms. (TheGlobal&Mail 2017-12-01)

Island Health has issued an advisory after a rash of overdoses in the last 24 hours in the downtown area of Victoria according to Dr. Richard Stanwick (CMHO) in October (CBCNews 2017-10-27)

Recommendations based on a review by the First Nations Health Authority and the B.C. Coroners Service:

- Promoting connectedness to peers, family, community and culture.
- Reducing barriers and increasing access to services.
- Promoting cultural safety, humility and trauma-informed care within organizations.
- Eliciting feedback through community engagement. (CBCNews 2017-10-27)

Welcoming students: Canadian Universities respond to fentanyl crisis

Karen Bartlett School of Population and Public Health, University of British Columbia. * karen.bartlett@ubc.ca*

The University of British Columbia isn't the first, and fortunately (or unfortunately), won't be the only university facing the reality of providing students with life-saving naloxone kits.[1] UBC students can ask for free naloxone kits on campus, and receive training in recognizing overdose signs.

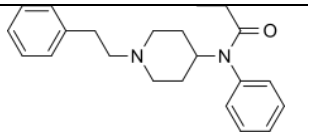
In Nova Scotia, University of Kings College in Halifax trained 70 staff in the use of naloxone kits which will be available in residence reception desks. At Dalhousie, students can obtain their own kits through pharmacies, or through Dalhousie University's health and wellness centre. At Cape Brenton University, security officers have undergone training, and the CBU health centre demonstrates how to administer the kits. St Francis Xavier University in Antigonish wants to be ahead of the curve and offered awareness training during orientation week, while Saint Mary's University is exploring options for responding to incidents.[2] Meanwhile, at UBC, the initial roll out of naloxone kits wasn't immediately picked up by incoming students, as there was a perceived stigma attached to admitting to personal illicit drug use. The Alma Mater Society (AMS) enlisted the help of Karmik to suggest ways to provide training. A take home message is that even today's party drugs are now showing up contaminated with fentanyl.[3]

The Globe and Mail reports BC Coroners Service statistics that in the first seven months of 2017 there were 876 suspected drug overdose deaths and fentanyl was detected in 81% of them. This is in stark contrast to the stats from 2016 with 482 overdose deaths January – July, and 60% due to fentanyl.[4]

The BC Coroners Service adds carfentanil has been detected in 37 illicit drug overdose deaths from June – September 2017. January to September 2017 Fraser Health Authority had the highest number of overdose deaths (295) followed by Vancouver Coastal Health (269) and Vancouver Island Health Authority (155).[5]

In case anyone has been hiding under a rock, illicit fentanyl is being blended into other drugs, and with no handy warning labels.

Bioavailability	Half Life/h
Transdermal 92%	20 - 27
Intranasal 89%	6.5
Buccal 50%	5.4 - 6.3
Ingestion 33%	



https://en.wikipedia.org/wiki/Fentanyl

Fentanyl was introduced in the mid-1990s, and by 2012 was the most widely used synthetic opioid in medicine. Obviously it isn't the legal use of fentanyl that is the problem. In the Vancouver area, there is a daily awareness of fentanyl use, but many citizens still associate the illicit use with the Downtown East Side. The Downtown East Side might be the safest place to use illicit drugs in BC, as there are resources through safe injection sites, and equipment to test street drugs for the presence of fentanyl .[6]

Naloxone blocks the effects of opioids, and acts within two minutes given intravenously, within five minutes if injected into muscle. Naloxone is also absorbed intranasally.[7] Multiple doses of Naloxone may be required in the event of an overdose as the duration of action of opioids such as fentanyl is longer than that of naloxone.

Naloxone kits are available free of charge to people who are using illicit drugs, and can be purchased from identified pharmacies by other citizens. The BCCDC has distributed more than 50,000 kits in 2017 as part of their take-home naloxone program. [8]

What is newsworthy is the examination of the optics of death by overdose involving fentanyl. It is not generally known that the risk of death by fentanyl exposure is greater in areas outside the Downtown East Side. It is the single, recreational user who is at a much higher risk of death, hence the public awareness campaigns launched by UBC and other Canadian Universities. It shouldn't come as a surprise that students, launching into their first away-from-home experience, may find themselves facing new avenues of social expression. When naloxone kits were first introduced at UBC in September, there were no takers, as students didn't identify themselves as being illicit drug users. The Alma Mater Society hit closer to the mark in identifying the possibility of party drugs as a source of fentanyl. Peer to peer education and training provides harm reduction in a format that students are more likely to make use of.[2]

Other peer to peer harm reduction resources are available through the BC Overdose Action Exchange.[9] In their 2017 report, 10 key actions were identified to help control of the crisis. Excerpts from the 2017 report:[9]

1. Engage peers in program development and leadership
   a. Peer to peer training, listen to lived experiences
2. Address contamination of the drug supply

Expand drug testing beyond qualitative to quantitative results on potency

3. Support appropriate pain management strategies
   a. Consider a multidisciplinary approach including counselling and physical therapy; decrease wait times for referral services
4. Build on the success of Overdose Prevention Sites
   a. Provide funding to pay peers for their participation in program development/consultation, outreach and front-line work
5. Expand and improve addiction treatment
   a. Use telehealth infrastructure to improve access in rural areas, weekends and evenings
   b. Increase access to treatment options for youth
6. Align law enforcement efforts with public health
   a. Expand training for those in the criminal justice system
7. Reform drug laws
   a. Strike a provincial coalition to build British Columbia's vision of drug law reform
8. Address structural barriers and upstream factors

a. Support services for youth and parents across BC

b. Increased access to education and programming that support strengths-based approaches and community connectedness

9. Counter stigma against people who use drugs
   a. Create non-stigmatizing language and cultural competency guides
   b. Work with peers to develop a mandatory online training course for frontline health care providers about cultural competency, harm reduction and trauma-informed care
10. Implement targeted research, surveillance and evaluation initiatives
    a. Create targeted research initiatives (example: surveillance data on people using alone in private residences.
    b. Implement evaluation plans for all new overdose response and prevention initiatives

Canadian Universities are taking bold action to deliver services to students by providing resources, education, and peer to peer support groups. It is sobering to those of us who were once university students ourselves to realize how much the terrain has changed from those bucolic days of yore.

References: 1. news.ubc.ca/2017/09/06/Canadian-universities-stock-up-on-naloxone-kits

2. http://www.cbc.ca/news/canada/nova-scotia/naloxon e-drugs-overdose-university-training-kits-opioids-1.4270187

3. http://vancouversun.com/health/local-health/overdose-crisis-mass-naloxone -training-sessions-to-be-held-at-ubc

4. https://www.theglobeandmail.com/news/british-columbia/fentanyl-found-in-81-per-cent-of-overdose-deaths-in-bc-coroner/article36196973/

5.*www2.gov.bc.ca/assets/gov/public-safety-and.../fentanyl-detected-overdose.Pdf* *6.* https://en.wikipedia.org/wiki/Fentanyl

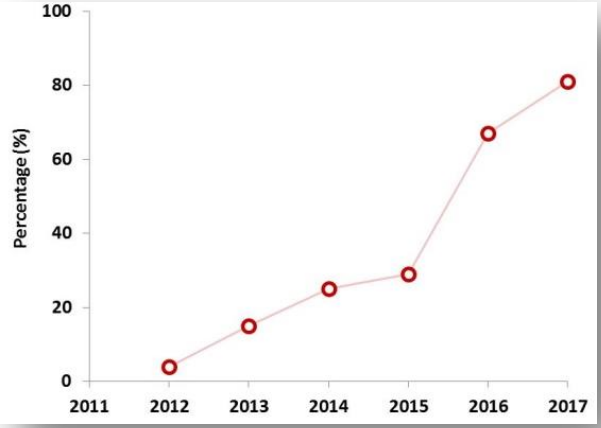
7. https://en.wikipedia.org/wiki/Naloxone

8.www.bccdc.ca/resource-gallery/Documents/bccdc-overdose-action-screen.pdf

9. http:// towardtheheart.com/odax-2017

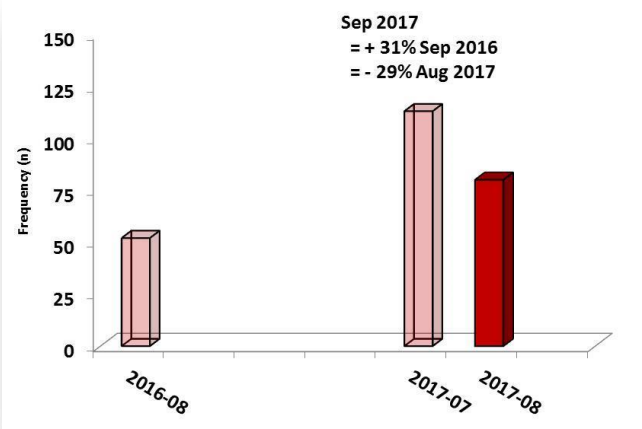
Drug Overdoses and Forensic Toxicology in BC (II) – BCTOX

Fentanyl Detected Illicit Drug Overdose Deaths in BC

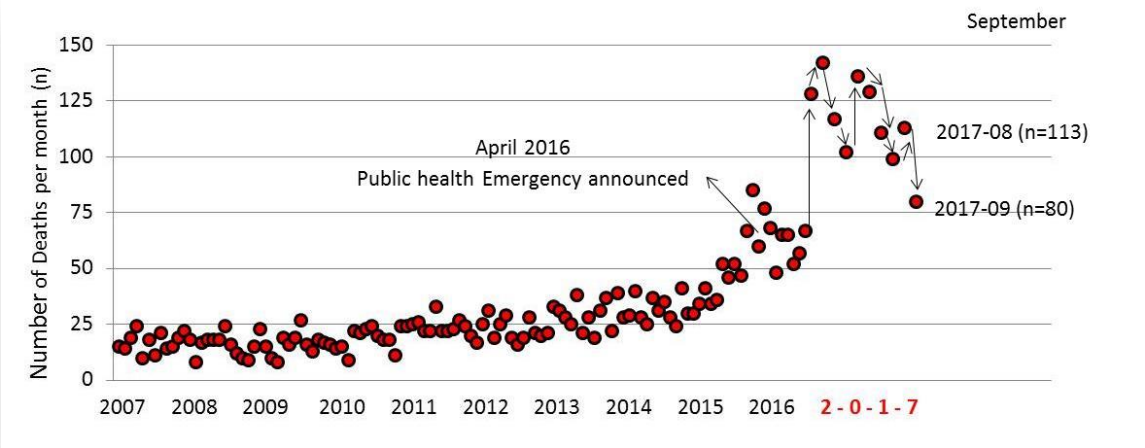


Fentanyl Detected Illicit Drug Overdose Deaths (2012- 2017 July) [BCTOX graph] [LAST UPDATE – July] Data from (BCCoronersService(b) 2017-09-07)

Estimation of Illicit drug overdose attributed deaths in BC in October 2017



The number of Illicit drug overdose deaths in Sep 2017 was 80 which is 31% higher than September last year and 29% lower than last month [BCTOX graph] [LAST UPDATE - Nov] Data from (BCCoronersService 2017-10-12)



Illicit drug overdose deaths per month in BC (2007 to September 30, 2017) [BCTOX graph] [DATA LAST UPDATE – Nov 9, 2017]
The pattern of overdose deaths suggests that the sharp increase in deaths has reached a plateau, and gradually decreasing. Data from (BCCoronersService 2017-11-09)

Toxic exposure mediated via AIR in BC(II)-BCTOX

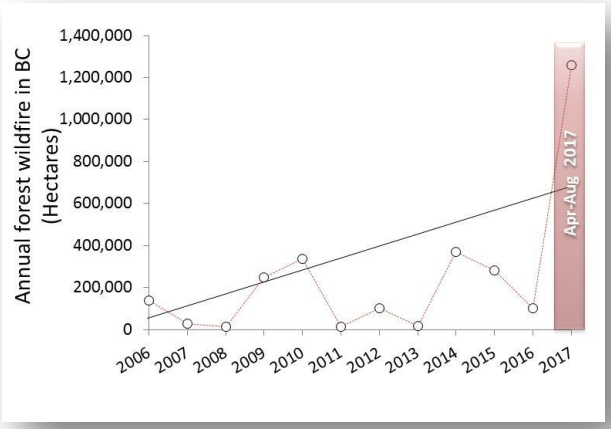
Wildfires in BC since 2006

Mean (min - max) wildfire in BC from 2006 to 2016 are:

- Total fires was 1844 (653 (2011) - 3064 (2009)),
- Total hectares 154944 (12604 (2011)-369 (2014))
- Total cost 182 (54 (2011) - 297 (2014)) millions dollars

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

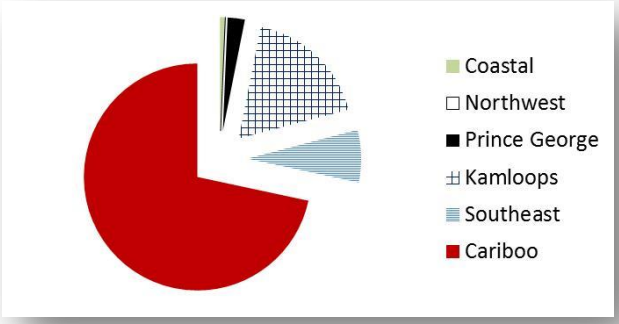
Total wildfire from April 1, 2017 to Nov 30, 2017 (current fiscal year) in BC is 12,154 km^2.



Annual forest wildfire in BC (Hectares) (2006 to 2016) . Depicts wildfire from April 1, 2017 to Nov 30, 2017 (current fiscal year) (12,1154 km^2) Source of data BC Wildfire Service [BCTOX Graph]

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

Distribution of wildfire in BC



Current Statistics from BC Wildfire service shows that a total of 1,215,452 hectares burned from April 1, 2017 to Nov 30, 2017 (current fiscal year) in BC.

Distribution of wildfires in BC from April 1, 2017 to Nov 30, 2017 is shown in the figure. Source of data BC Wildfire Service [BCTOX Graph] (BC-Wildfire-Service)

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Climate change in BC

Arctic Council, eight countries that ring the North Pole released its new report of 2010 to 2016.

- Methane and CO_2 will be released from the soil as a result of global warming, which wasn't considered in previous models.
- The highest organic carbon contents occurred in peat soils and peaty cryoturbated mineral soils (32.2–69.6 kg/m^2).
- Arctic soil carbon stocks converge on the range 1400–1850 PgC[1] for all northern permafrost soils

Arctic continues to warm at twice the pace of mid-latitudes at up to 5°C by 2040. Cumulative global impacts related to Arctic change are estimated in the tens of trillions of U.S. dollars." (CBCNews 2017-11-20)

Arctic Sea Ice from March to September 2017 Watch YouTube

Wildfire and climate change

This summer cannot be another wakeup call," --- "This has to be the call to action and it needs to happen now." (NationalObserver 2017-11-14)

The weather was exceptionally hot and dry in summer 2017. 85 maximum temperature records were broken between the third week of June and the September long weekend according to the UBC forest ecology professor Lori Daniels. (NationalObserver 2017-11-14) Warmer temperatures will increase the probability of heat stress and extreme weather situations such as flooding and fires. (CBCNews 2017-11-12) Rapidly rising risks of in regions with the most significant rise in wet bulb globe temperature.

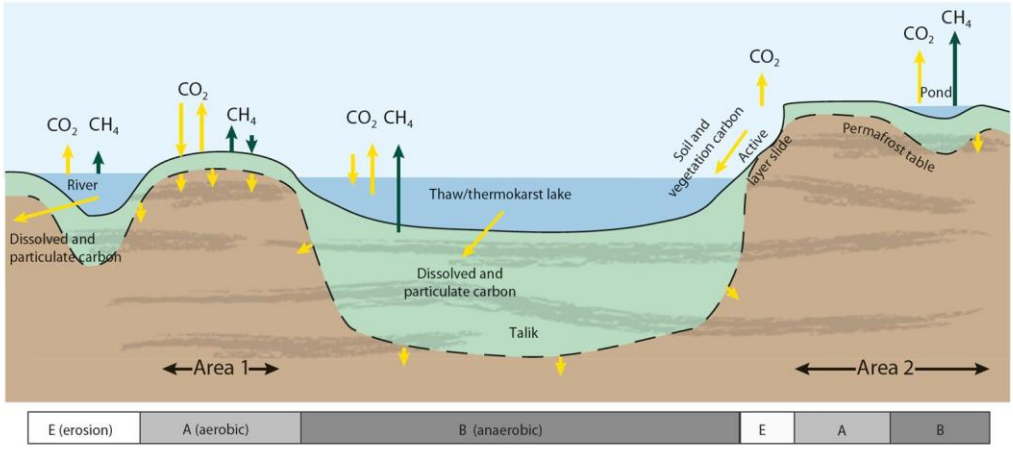
Who should pay for climate change consequence in Vancouver?

The City of Vancouver debated recently for a storm surge protector for $800-million for False Creek or to increase seawalls for $300- to $400-million as a result of climate change[?]. Should the tax payer cover this cost?

What about a campaign for pollutant to pay the price for "climate accountability" similar to the wave of successful litigate against tobacco companies says West Coast Environmental Law. (MetroVancouver 2017-11-09)

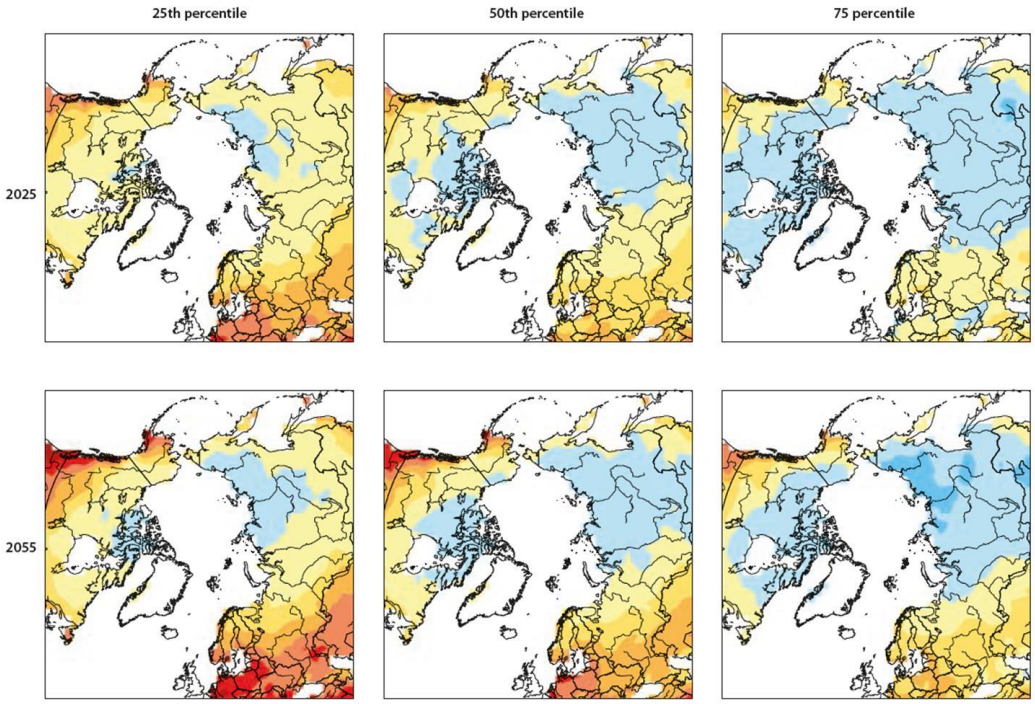
Murky Waters: Taking a snapshot of freshwater sustainability in BC was released in Nov 2017 by Real State Foundation, BC. Recommendations are good to look at!

[1] One Pg =1015 grams=one billion metric tonnes.



Will global warming lead to the release of CO_2 or CH_4 from Soil?

Low temperatures, wet conditions and permafrost leads to accumulation and preservation of organic matter in soils, as the decomposition rates are low. Permafrost soils occur on about 25% of the land area (23 million km^2) in the northern hemisphere. Arctic soil accounts for half of the global soil carbon. Decomposition of this carbon [excluding fire] as a result of warming Arctic lead to emissions of CO_2 or CH_4 is an important feedback to climate warming.



Could BC become more affected than the rest of Canada?

Projected relative change (%) in mean annual maximum monthly snow water equivalent (SWEmax); A comparison of 2025 and 2055; under a good scenario i.e. Representative Concentration Pathways "(RCP) 4.5"*. As can be seen BC is more affected as compared to central parts of Canada .

*RCP4.5 scenario assumes *reductions in emissions* lead to stabilization of greenhouse gas concentrations in the atmosphere by 2100 and a stabilized end-of-century global average temperature rise of 1.7–3.1°C above pre-industrial levels. It refers to 16 CMIP5 models with respect to 1986–2005.

Toxic Exposure Mediated via PRODUCTS - BCTOX

Toxicological related product recalls / alerts **(Recalls-and-safety-alerts) - Updated 2017-10-26**

Date	Items --- Reasons to recall
2017-11-24 ADVISORY	"Health Canada safety review finds low incidence of breast implant-associated anaplastic large cell lymphoma (BIA-ALCL) reported in Canada". IA-ALCL is not a cancer of the breast tissue. Five confirmed Canadian cases of BIA-ALCL have been reported by Canadian manufacturers in the last 10 years. This is equal to 1 case of BIA-ALCL per 77,190 implants sold, or 0.0013% (subjected to under reporting. The rate of occurrence of BIA-ALCL per textured implant sold in Canada is 1 case per 24,177 or 0.0041%.
2017-11-22 Recall	ITW Permatex recalls Permatex® Rust Dissolver Gel Rust Dissolver Gel which is intended to dissolve rust on metals and alloys and rinse off with water. It does not meet the labelling and child-resistant packaging requirements for consumer chemical products (Consumer Chemicals and Containers Regulations, 2001).
2017-11-16 Recall	Anafranil 10 mg (Clomipramine Hydrochloride), as the assay is out of specification in the affected lot. Retailers/pharmacies across Canada
2017-11-16 Recall	Green Tea Extract-Containing Natural Health Products - Rare Risk of Serious Liver Injury *Green tea in any form, including as an extract, is considered generally safe for the majority of consumers.* Cases of serious liver injury associated with the use of green tea extract-containing natural health products continue to be reported worldwide. However, they are rare and unpredictable (idiosyncratic) events.
2017-11-15 Recall	All (lots) of Gimme Brow Volumizing Eyebrow Gel manufactured by Benefit Cosmetics LLC. This product is available in three shades (01-Light, 03-Medium, 05-Deep) and creates natural fuller-looking eyebrows.
2017-11-07 Recall	Novamoxin 125mg/5mL [AMOXICILLIN (AMOXICILLIN TRIHYDRATE)] The homogeneity is out of specification in the affected lot.
2017-11-03 Advisory	The unauthorized health product "E-Fong XuDuan Concentrated Herb Tea" may pose serious health risks, including an increased risk of miscarriage and birth defects. Health Canada laboratory testing found that the tea contains trace amounts of mycophenolate, a prescription drug.

Photo adopted from Medial News Today

Toxic exposure mediated via FOOD in BC (II) - BCTOX®

Toxicological related food recalls in BC

Dates	Food (Company / Firm)	Reason to recall	Class	
2017-11-01	Food Recall Warning - Maple Leaf brand Chicken Breast Strips recalled due to a toxin produced by Staphylococcus bacteria		2	National

Bi weekly marine bio-toxin monitoring in West Coast BC in *November* shows:

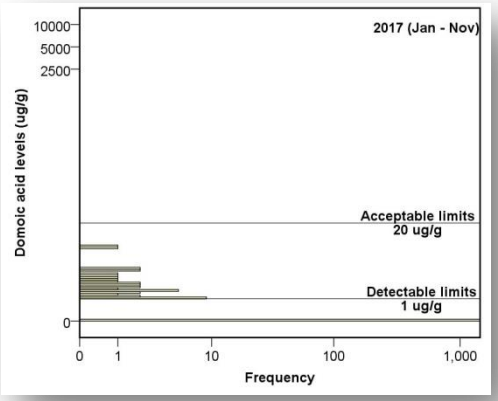
- ✓ Below regulatory limits Domoic acid [Amnesic Shellfish Poisoning] are reported.
- ✓ ***Above*** regulatory limits of Saxitoxin [Paralytic shellfish poisoning] concentrations are on the rise again
- ✓ Below regulatory limits of Okadaic acid and dinophysis toxins [Diarrhetic Shellfish Poisoning] are on rise

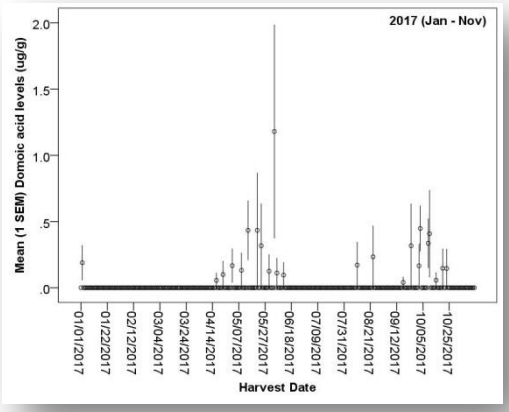
--- See next page for the details.

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

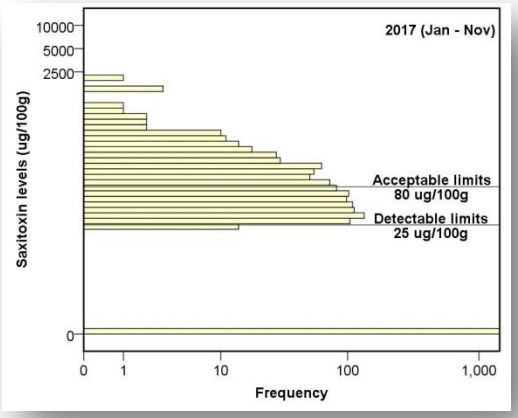
Marine biotoxins (January to November 2017) in BC - Data from CFIA – BCTOX graphs

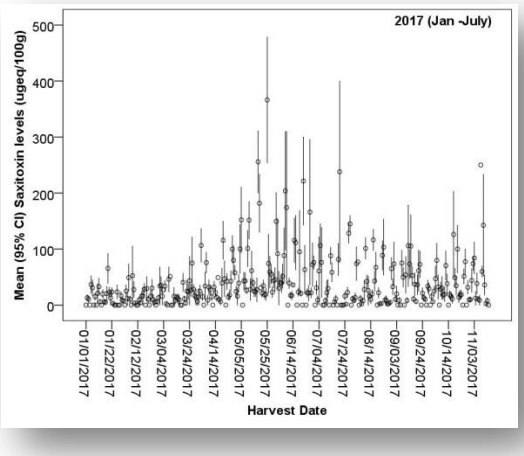
Frequency **Mean (1 SEM) concentrations**



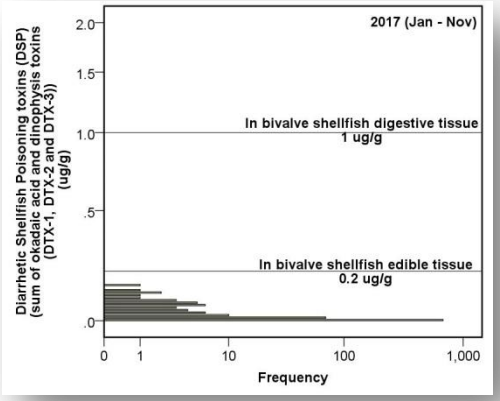


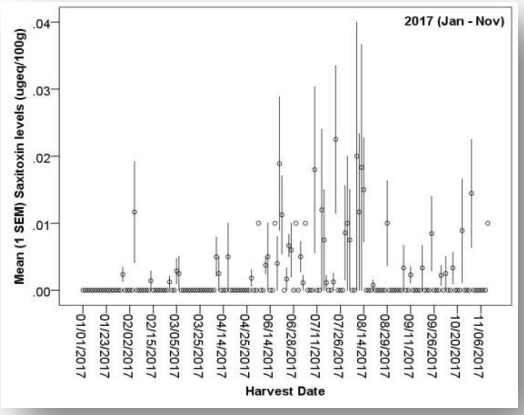
Domoic acid **(ug/g) (Amnesic shellfish poisoning (ASP)) among detected shellfish samples in BC (January to 23 November 2017) (n=37 out of 3017) [This graph is prepared to imply the trend, and it should be interpreted with caution] [BCTOX Graph]**





Saxitoxin **(ug/100g) (Paralytic shellfish poisoning (PSP) among detected shellfish samples in BC (January to 23 November 2017) (n=1120 detected out of 3515 samples) [This graph is prepared to imply the trend, and it should be interpreted with caution] [Data from CFIA - BCTOX Graph]**





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 23 November 2017) (n=113 detected out of 791 sample) [This graph is prepared to imply the trend, and it should be interpreted with caution] [BCTOX Graph] [Data from CFIA - BCTOX Graph]**

Toxic exposure mediated via WATER in BC

Hundreds of BC Gas Wells Leak Methane

Methane leaks from shale gas wells can travel great distances in aquifers that affect climate change *or water*. (TheTyee 2017-11-23)

Toxic Spills/Dumps

"Significant spills" reported by Spill Incidents [oil or hazardous material] in BC are as follows. Further information click on each item. (accessed Nov 27, 2017)

Date	Name	Source	Nearest Community	Spilled Content
2017-11-26	POTENTIAL: Tug Jake Shearer SW of Bella Bella	Fuel Barge	Bella Bella	?
2017-11-23	Hells Gate Train Derailment	Train Engine	Hells Gate	Fuel
2017-11-21	South Okanagan Hazmat Incident	Unknown	Kaleden	Caustic Substance
2017-11-15	Logging Truck Engine Fluid Spill near Caycuse B.C.	Logging truck	Caycuse	Fuel

20,000 litres of a phenol formaldehyde resin, a corrosive liquid, spilled on the Coquihalla Highway Tuesday following a tractor trailer fire. (CBCNews 2017-11-28)

Photo adopted from (CBCNews 2017-11-28) - RAM Environmental Response Ltd.

Toxic exposure mediated via SOIL in BC

Updates on Canadian Soil Quality Methanol Guidelines

The Canadian Council of Ministers of the Environment (CCME) has published updated human health and environmental soil quality guidelines for methanol. This document reviews chemical and physical properties of methanol, Canadian emission sources, distribution and behaviour in the environment and effects in humans and mammals. Natural emission sources of methanol include volcanic gases, vegetation, microbes and insects. Methanol can also be emitted through improper handling and storage or failure of oil pipelines. (CCME 2017)

In individuals, a blood methanol level mean and standard deviation of 1.36 mg/L and 0.77 mg/L has been reported. Methanol is naturally found in blood, urine, saliva and exhaled air. Factors for determining guideline values for human health included methanol ingestion of soil, indoor air inhalation, and groundwater for drinking water. For human health, soil quality guidelines for methanol were set at 4.6 mg/kg for coarse soil and 5.6 mg/kg for fine soil. These levels apply for four different types of land uses: agricultural, residential/parkland, commercial and industrial.(CCME 2017)

Grassy Narrows First Nation mercury contamination

Ontario's Grassy Narrows First Nation has recently found out about continued mercury contamination poisoning of fish and the people who consume them in the Wabigoon River, despite government knowledge dating back to the 1990s.

The source was 10 tonnes of mercury dumped into the river between 1962 and 1970 from a mill owned by Reed Paper. Residents were told that the river would, over time, undergo self-cleaning. A 2016 report shows that samples of groundwater over the years have contained extremely high levels of mercury.

Following mercury discovery in the soil, groundwater tested at nearby wells found mercury at more than 4,482 times the provincial water quality levels (0.29 micrograms per litre). Furthermore, a well-tested in 2016 returned mercury levels three times the provincial threshold.

Currently, the province has announced an $85-million plan to clean the river. So far, 35 drums of mercury-contaminated soil have been removed from the site, and a plastic barrier may have been installed to contain contaminated soil.

Symptoms reported to include loss of muscle coordination and tunnel vision. Furthermore, fetuses are particularly vulnerable to cognitive damage. (Bruser D and Poisson J 2017-11-11) (Bruser D and Poisson RBJ 2017-11-16)

Adverse Reaction Reporting Canada Vigilance Program

1

BCTOX's Toxicology Surveillance in BC

BC internet Searches

Since the current issue, BCTOX is reporting the trends of Public-&-Professional searches for major toxicology related terms in BC as a new surveillance system using google trends as surrogates of public interests. The following graphs show the proxy frequency of searches for the keywords from Dec 2016 to Nov 2017. Each variable is compared with itself (the highest frequency of searches over a two week period in the past 12 months 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 is losing their relative interest in "fentanyl" as compared to search term "opioids" (figure A). This finding is also consistent when fentanyl searches are compared to "cannabis" and "cocaine" (figure B). Observation happened despite the fact that fentanyl overdose induced deaths have remained high. This finding has public health relevance in the province. Measures should be taken to avoid loss of interest or social fatigue regarding the relative importance of "fentanyl" among the public. Increased searches for cannabis is probably related to current legalisation process.

Public searches for "furanylfentanyl (Fu-F)" (less potent) and carfentanyl (more potent) analogs of fentanyl were also observed.

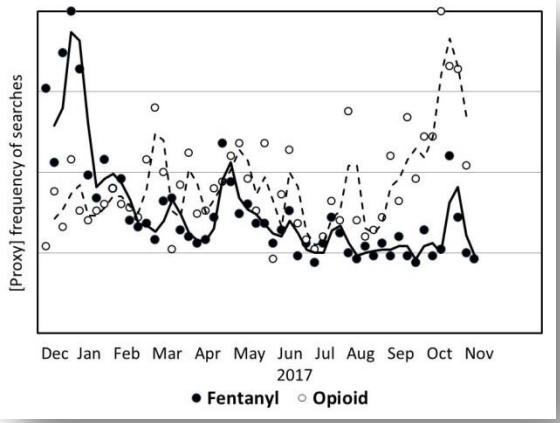


Fig A. "Fentanyl" public searches as compared to "opioids" as a whole (frequency of searches from Jan to Sep 2017) (n)

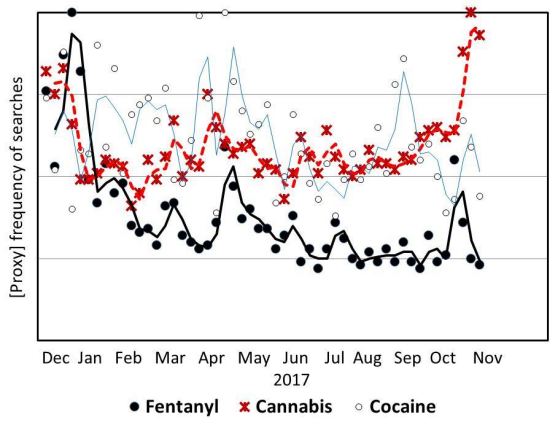


Fig B. "Fentanyl" public searches as compared to "Cannabis" and "Cocaine" (frequency of searches from Jan to Sep 2017) (n)

The pattern of searches for "air pollution" was disrupted in July and August, which coincide with forest wildfires (fig C). 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".

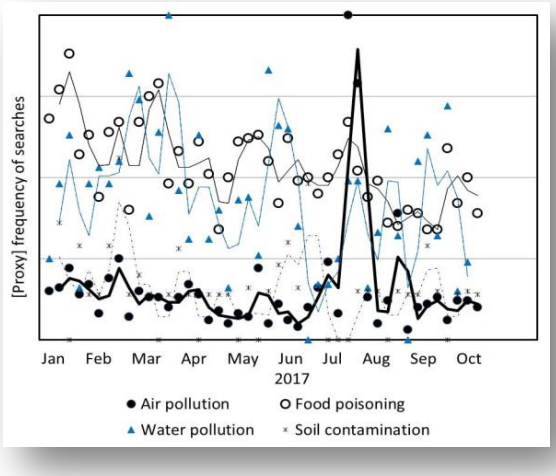


Fig C. "Air pollution" as compared to other routes of exposure (forest wildfires disrupted the pattern) (frequency of searches from Jan to Sep 2017) (n)

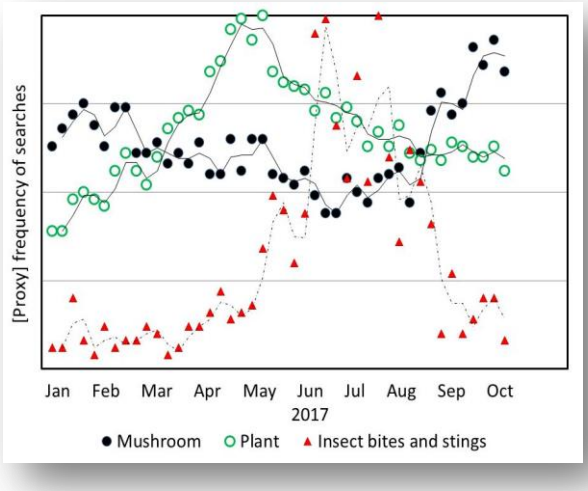


Fig 4. "Bites or stings" as compared with "plants" and "mushroom" (frequency of searches from Jan to Sep 2017) (n)

Popularising the Science of Toxicology by Reza Afshari

Solve the mystery: what could be the "acute high dose" or "long term low dose" chemical/drug exposure that caused or contributed to the Mysterious Dancing Epidemic?

Take a guess, and email back your response to be entered in the BCTOX drawing for $20 gift card. (Deadline Nov 10, 2015)

- If you send just a diagnosis you will be entered once.
- If you send the potential reasons justifying 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.

In recent years, many investigations have examined history and social science from a new toxicology angle, a novel approach that potentially adds scientific weight to a field that has commonly relied on psychological clichés to justify certain social historical events. In essence, this article aims to contribute to a neglected and complex epoch of the history of toxicology at the population level, using dance epidemics in Europe as an example.

What were the events (dance epidemics)?

Frequent and widespread dance epidemics (dance mania, St. Vitus dance or St. John's dance) presenting with peculiar behaviors and convulsion were documented between 1085 and 1927 CE from east of the Rhine and west of the Rhine (where gangrene was reported). (Eadie 2003) Certain reports also documented older events extending to 7th century CE (Backman EL 1952) (McAlister 1977). Chronicles are as follows:

1021 CE in Germany

It was reported that 18 people gathered outside of a church, while dancing excitedly on Christmas Eve 1021 CE. The priest, unable to perform Mass, angrily asked them to stop. However, the dancers ignored him and continued dancing wildly while clapping, leaping, and chanting in harmony and holding hands. A local chronicler documented this event as a "ring dance of sin".

Sinners could not stop dancing for the whole next year, as though the priest cursed them for their shameful cheerfulness. They regained control of their limbs, while exhausted and repentant at the next Christmas, when the cursed finished. Dancers fell into a deep sleep at some points due to exhaustion, during which some of them never woke up.

1237 CE, Erfurt to Arnstadt

In this event, a large group of children travelled from Erfurt to Arnstadt (about 20 km), jumping and dancing the entire way.

1247 CE in Erfurt, Germany

In this occasion, 200 people started dancing unstoppably and resulted in some fatalities.

1374 CE in Aachen (Aix-la-Chapelle)-West Germany, Northeast France and the Low Countries

In this year, a dance epidemic swept across a wide geographical area in Europe. It was documented that these sinners shouted out the names of devils, saw visions, hated the colour red and shoes, while performing their demonical dances. They claimed they were drowning in "a red sea of blood"! Dancers were sinners who were possessed by the devil. (Toxipedia-Gilbert S 2016-updated) According to the reports, men, women, and children joined hands and danced together in the streets for hours. The dancers shrieked, chanted, saw visions, called upon both God and demons, and finally fell down, complaining of severe abdominal pain and bloating. Stupor and sleep often supervened. (Hecker JFC 1885) The dance mania spread to Cologne, northwest Germany, Flanders, the southern Rhine provinces, and Trier. (Backman EL 1952)

1278 CE, River Meuse in Germany

It was reported that 200 people unexpectedly started dancing on a bridge over the River Meuse in Germany in 1278, resulting in its collapse. Many of the survivors regained full health at a nearby chapel dedicated to St Vitus.

Few reports from the next decades

On one occasion, the abbot of a monastery near the city of Trier quoted to recall an amazing dance mania in which a collection of hallucinating dancers hopped and leapt for as long as 6 months, some of them dying after breaking "ribs or loins". Other minor reports include events from 1381 CE in Augsburg, 1418 CE in Strasbourg and 1428 CE in Schaffhausen. In another description, a monk danced to death in 1428 CE in Zurich.

There were also several isolated cases during the 1500s and 1600s, including an event involving a group of children in 1536 in Basel, and in 1551 in Anhalt, (McAlister 1977). In fact, a drawing called "The Dancing Pilgrims at Muelebeek" by Pieter Bruegel the Elder (152O-1559 CE), depicts the ritual of the dance mania in a suburb of Brussels in 1564. (McAlister 1977)

1518 CE in Strasbourg, France (Waller 2008) (Waller 2009)

One of the largest and most well documented dance epidemics happened in Strasburg, France in 1518 CE, in which 400 people experienced an unstoppable urge to dance, with hopping and leaping for days or even weeks. Performers rarely stopped dancing to eat, drink or fell sleep as a result of exhaustion. It is documented that dozens of people died in this event. This event was minutely detailed with the help of municipal orders, sermons, and vivid descriptions left behind by the father of toxicology, Paracelsus. Men, women, and children were dancing involuntarily writhing with pain, screamed for help and begged for mercy in a punishing summer heat. There were accounts of people who had temporarily recovered their wits, deliberately dancing themselves back into oblivion with the expectation that only in this way they could lift the curse.

The Dancing Pilgrims at Muelebeek" by Pieter Bruegel the Elder (152O-1559 CE), depicts the ritual of the dance mania at a suburb of Brussels in 1564. (McAlister 1977)

Strasbourg authorities mandated that the dancers go on dancing all day and night. They also constructed a special stage in the heart of the city, where they could move freely, and hired professional dancers and musicians to keep them in constant motion. The policy was obviously a disaster and helped spread a psychic contagion and dramatically escalated the dance mania epidemic. They made victims perform their dances in a nightmare social scenario.

Clinical findings

Epidemics happened in a period of over a millennium, and seized in recent centuries. Episodes were reported from various single or wide-spread geographic areas and happened in different places and dates ranged from certain important places (i.e. in front of St. Vitus statue or a church) and dates (i.e. Christmas or following a bad year for harvest) to nonspecific places. The epidemics happened unexpectedly and simultaneously in a group of male, female and child cases, which is consistent with non-communicable epidemics at different population sizes ranged from 1 to 400 people.

Clinical findings included dancing with peculiar behaviors, clapping, leaping and chanting in by holding hands. Visual and auditory hallucinations (i.e. seeing visions, hating red colour red and shoes), and calling upon both God and Devil were also reported. Their experience was involuntary and unpleasant with pain of sore, swollen, and lacerated feet, exhaustion, and low consumption of food and sleep, stupor, convulsion and sleep and in some cases death. Nausea, vomiting and abdominal pain were also common. They experienced altered states of consciousness with a trance and extraordinary levels of endurance. For the cases that did not die of exhaustion, no permanent sequels were reported. They were less conscious of their physical exhaustion. The cause of death was mysterious and unknown, but perhaps due to exhaustion.

Probable causes

The unknown epidemic of dancing mania could be attributed to a variety of causes including:

Sin theory

Contemporary reports are in favour of this theory. The power of the devil as the counterpart of God with tempting and deceiving was profound in middle ages. Insanity was constituted by folly, possession, and melancholia and interpreted by witchcraft (Backman EL 1952) (Midelfort HCE 1999) (Mora G 2000). Health and diseases were attributed to supernatural sources. Co-occurrence of certain epidemics with religiously important dates such as Christmas and places such as sinner's dance who were possessed by the devil in front of St. John's monument (Toxipedia-Gilbert S 2016-updated) supports this idea. Christian Saint Vitus martyred by boiling in oil by Romans 303 CE in Lucania, Italy. For unknown reasons, it was perceived in 16th century Germany that dancing in front of his statue during the feast of Saint Vitus would bring health for the next year (CatholicSaints.Info). Dancing mania was attributed to corruption of the festival of St. John's Day by ancient pagan customs, and an ordeal sent by a saint, or a punishment from God for people's sins in the 14th and 16th centuries respectively (Lanska 2018). Ergotism was also described by burning pain or ignis sacer (holy fire) (Schiff 2006).

Medical theory

The medical theory included tarantism in Italy, as victims were believed to have been bitten by tarantula spiders (Prochwicz and Sobczyk 2011). Epilepsy (Prochwicz and Sobczyk 2011) Sydenham's chorea or St Vitus's dance as a late complication of childhood infection with Group A beta-haemolytic Streptococcus a common cause of acute rheumatic fever. Rabies, syphilis, encephalitis, epilepsy and typhus could explain certain clinical findings.

Psychological and Social theory

Dancing mania in 13th and 18th centuries was a clinical and cultural phenomenon (Prochwicz and Sobczyk 2011). Mass hysteria, hysteria cholera and exotics religious cults may explain some of the findings. (Prochwicz and Sobczyk 2011) (Kapronczay 1977) Mass hysteria is described as transmission of collective illusions of threats, whether real or imaginary, through a population in society as a result of rumors and fear (Wolf 1976) (Woolf 2000).

Toxicological

The epidemics happened unexpectedly and simultaneously, which is consistent with non-communicable (toxic exposure) epidemics. Among the most causes is ergot exposure. Ergot alkaloid compositions are produced by different strains of fungus (mould) Claviceps purpurea that grows in various soils on stalks of ripening rye and other cereals and contaminates the grains and consequently the flour. Consumption of high doses of ergot-contaminated foods by individuals or populations may cause convulsive ergotism. If the dose increases, peripheral ischemia may happen, called "Saint Anthony's Fire" or gangrenous ergotism. Ergot alkaloid contamination of livestock feeds has long been known and has been described in various places. (Shelby RA 1999) Epidemics of ergotism certainly occurred in mediaeval Europe when storage of gains was not ideal. Extended periods of increased moisture and cold during flowering promote the development of ergot in cereal crops. (Coufal-Majewski, Stanford et al. 2016) Ergot contamination negatively impacts both human and animal health. In difficult years for agriculture, crop failures may have forced individuals or populations to consume grains that remained from the previous year, or freshly harvested, infested rye, in which contamination more highly likely.

The clinical features of convulsive ergotism include muscle twitching and spasms, tremor, changes in mental state, hallucinations, sweating and fever, mania and psychosis that could last for several weeks. This is related to serotonergic overstimulation of the CNS, so called serotonin syndrome. (Eadie 2003) The ergot alkaloids, dihydroergotamine are serotonin agonists that can induce serotonin syndrome. Serotonin syndrome may, therefore, have been a public-health problem long before it was recognised as a complication of modern psychopharmacology. (Eadie 2003)

Rye parasitized by ergot sclerotia of C. purpurea: (photograph courtesy Matthew Foltz). Adopted from (Belser-Ehrlich, Harper et al. 2013)

Scientifically accepted epidemics of ergotism

Epidemics of ergotism in population level are not farcical proposition. Morgan investigated an outbreak of ergot poisoning in Manchester, England, in 1927, which involved over 200 Jewish refugees, most of whom had gangrenous signs, but also had headache, nervousness, and intense itching with the sensation of insects crawling along their backs. All ate bread prepared from rye grown in South Yorkshire, as much as half a loaf per day. (Morgan 1929)

Over 11,000 cases of ergotism were reported in a population of 506,000 in the vicinity of Sarapol, near the Ural mountains, from 1926 to 1927 (Schiff 2006). A more recent epidemic in Ethiopia in 1978 followed the contamination of barley with ergot-infested wild oats. Reportedly 47 cases died and another 93 patients presented with symptoms such as weakness, nausea, vomiting, diarrhea, gangrene, and the loss of extremities (22% of cases). Another 50 - 60 infants died because their mothers, victims of

both famine (they did not produce enough milk to prevent their infants' starvation) and ergot poisoning (IPCS-WHO 1990). The most recent gangrenous ergot outbreak was also in Ethiopia, from February to August 2001 (Urga K, Debella A et al. 2002). Animal ergotism in heifers and cows has been reported in Australia (Fraser and Dorling 1983) and the United States Illinois in 1984 (Coppock, Mostrom et al. 1989) (Belser-Ehrlich, Harper et al. 2013).

Mixed theory

The majority of provided medical reasons for the epidemics are not far-fetched, and although there are many reasons to argue for toxicology basis of the epidemics, a sole toxicological cause seem to be unlikely. Mass hysteria could justify in part the continuation of the presentation, but not the real cause. Sin theory, a social belief structure in middle age Europe, could have played a role.

It seems that epidemics may have been initiated by toxic (ergot) exposure induced clinical effects such as muscle twitching, feeling pinpricks and pinches, burning sensations, altered mental state and hallucinations in previously healthy people. Strange symptoms could have been perceived to be related to supernatural or divine sources. A pre-existing belief in sin, or a curse and social intervention such as attention, cursing, and setting a stage through the Strasbourg epidemics may have led to a mass hysteria and remained for a longer period. People may have converted their distress to a frantic dance, attempting to overwhelm the devil by divine will as well as by exorcism on the human side. In certain cases dancing subsided, but people voluntary forced themselves into the dance group to avoid further curse.

None of the other explanations would be convincing, if toxic exposure as a triggering factor or contributor is excluded.

What do you think? What could be the "acute high dose" or "chronic low dose" toxic exposure that may have caused or contributed in developing the dance epidemics?

BC Drug and Poison Information Centre

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

Announcements - BCTOX

49th Annual Symposium of the Society of Toxicology of Canada, November 29 to December 1, 2017 in Montreal

Upcoming Toxicology jobs in BC (November 2017)

Occupational Hygiene Officer - WorkSafeBC - Vancouver, BC

Scientist, Clinical Research - Aquinox Pharmaceuticals Inc., BC

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