BCTOX

BC Toxicology News Monthly Bulletin

Monthly / Vol. 3 /No. 2 / Pages 195-209 February – 2018

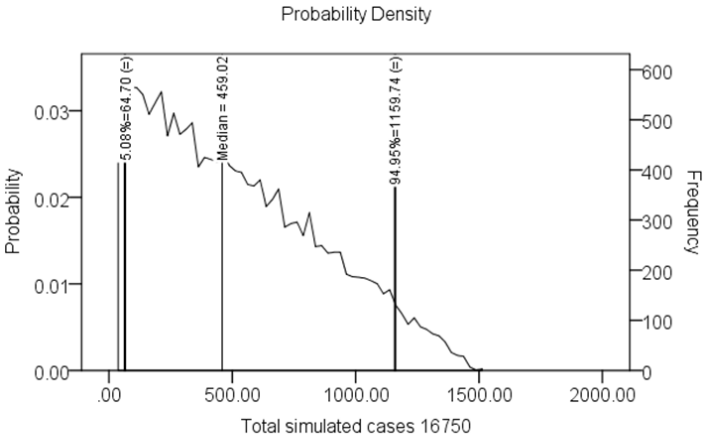
Keep Engaged with Toxicology News in BC

Contents

BCTOX is shared with 370 professionals in BC. It is a collaborative work & 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" are referenceable. How to cite abstracts of the current issue? Authors' surname, Initials, Title. *BCTOX* 2018; 3(1): Pages.

Underreporting (?) Paralytic Shellfish Poisonings in BC

BC Toxicology Picture/Graph of the Month



<64.70	64.70 - 1159.74	>1159.74
5%	90%	5%

Simulation; Potential frequency of Paralytic Shellfish Poisonings in BC

BCTOX has continuously monitored Saxitoxin, a marine bio-toxin that causes Paralytic Shellfish Poisoning (PSP), levels in BC using CFIA's data. It is now clear that while Saxitoxin exposure have frequently been high, and to a high extent, PSP cases are scares. Around 17 calls related to PSP are reported to BC Drug and Poison Information Centre annually. PSP, similar to other diseases could be under reported. Simulation of the data, suggests that cases may range from a few to 1500 cases annually *subject to assumptions & limitations*, and the probabilities of higher estimates are lower (figure). In this simulation, median estimated to be 450 cases (pages 206 and 207).

--- Use your expertise and help us to *Solve the mystery* of potential under reporting of PSP, please, and what can be done about it? --- To be entered in the BCTOX drawing for $20 gift card. (Deadline March 10, 2018)

BC Toxicology News Monthly Bulletin
BCTOX 2018 Jan 3(2): 195-209

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

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.

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BCTOX does not have a professional website yet, but materials could be found from

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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 Səl̓ílwətaʔ/Selilwitulh (Tsleil-Waututh) Nations.

Erratum from the previous issues See page??

Summary of the Toxicology News in BC and Health Authorities in January 2018

Reza Afshari*, Environmental Health Services, BC Centre for Disease Control, BC. Reza.Afshari@bccdc.ca [Editorial 2017-02-28]

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 January

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)

--- See next page for the rest!

Sola dosis facit venenum

Only the dose makes the poison!

Paracelsus (1493 – 1541 CE)

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

First Nations Health

In a new study, the association between water and sanitation infrastructure and health indicators among First Nations, Métis and Inuit individuals living on and off-reserve in Canada were surveyed. (O'Gorman and Penner 2018)

Authors found that among "individuals living off-reserve, contaminated water is associated with a 5-7% lower likelihood of reporting good self-rated health and a 4% higher probability of reporting a health condition or stomach problem."

Table 28 Illness prevalence by access to running water

	Mean*	Standard deviation	Number
No running water	0.533	0.516	15
Running water	0.127	0.334	110

Source: Authors' calculations using survey data

*$p = 0.0177$

Table 29 Illness prevalence by source of running water

	Mean*	Standard deviation	Number
Piped water	0.134	0.343	67
Water tank	0.184	0.391	49

Source: Authors' calculations using survey data

*$p = 0.4728$

Table 30 Illness prevalence by access to a flush toilet

	Mean*	Standard deviation	Number
No toilet at all	0.500	0.527	10
Flush toilet	0.131	0.339	107
Outhouse	0.250	0.500	4

Source: Authors' calculations using survey data

*$p = 0.0975$

Tables adopted from (O'Gorman and Penner 2018)

Fraser Health

Hidden epidemics

A lot of what is happening regarding the opioid overdose crisis is actually hidden from what we normally see or think. A hidden epidemic, according to Dr Lee.

Maple Ridge and overdose crisis

"Maple Ridge is among the B.C. communities hardest hit by the overdose crisis, and will be among 18 getting a new on-the-ground community action team and dedicated funding from Victoria." (MapleRidgeNews-2017-02-08)

Summary of the Toxicology News in BC in January 2018

Interior Health

Evaluation of Health and Environment Remediation of Lead Exposure in Trail Area, BC. --- Recent Development

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

History

A major lead and zinc smelting facility has been working in the Trail area in British Columbia for over 100 years, which led to emission of stack and fugitive heavy metals from the ore to the air, and resulted deposition of metals in dust in the area. (THEP 2014) Residents are mainly exposed to metals in the dust in air and soil.

Trail Area Health and Environment Program (THEP), formerly known as Trail Lead Program, is a longstanding initiative since 1988 to improve the Trail area environment, and promote and protect the health of the community related to smelter operations. THEP has five components of operation including air quality, family health, home & garden, property development, and parks & wild lands. (THEP 2014) (BCLocalNews-2018-02-08)

THEP offers "Family Health" services and a primary prevention program called "Healthy Families Healthy Homes" in which a public health nurse conducts visits for all children in the target area up to age 0-12, and blood testing for lead levels for children living in the Trail Area are performed.

This program is chaired by the Mayor, and focuses on families with children up to 36 months, and living in neighbourhood belonging to Area 2 and Area 3 of Trail. However, the program could be extended – on request- to older children that previously tested, and also children who live outside of Area 2 or 3 can also requested testing for children 6-60 months.

In addition, installation of the KIVCET smelter in 1997(THEP 2014) brought about substantial decreases in emissions. The declining trend has continued in this period and demonstrates continuous improvement on children's blood lead levels (BLL).

New developments

The average children's blood lead levels were 4.3 ug/dL in 2016. The ultimate goal of the project is to bring the BLL to the lowest level possible. On September 2017 blood tests of 146 children aged six to 36 months were measured, and average BLL was 4.0 micrograms per deciliter (ug/dL), which is the lowest recorded to date. (BCLocalNews-2018-02-08)

Teck's new Smelter Recycle Building has been in full operation in 2017 for the first time and as a result the average lead level in was air 0.16 micrograms per cubic metre (µg/m³), which is also the lowest ever recorded. It is also reflected by a further decrease BLL in local children.

The target sets for air quality goal for 2018 is 0.2 µg/m³ in 2018, which already has been achieved and for BLL is 3.5 ug/dL by 2020. (BCLocalNews-2018-02-08). Simple reminders including a combination of hand washing and leaving shoes at the front door, in addition to soil remediation, safe renovation tips, and full activation of the Teck's new Smelter Recycle Building.

References

BCLocalNews-2018-02-08 "Lead exposure on downward trend in Trail. https://www.bclocalnews.com/news/lead-exposure-on-downward-trend-in-trail/ (Accessed Feb 08, 2018)."

THEP (2014). Trail Area Health & Environment Committee. It Starts with the Kids. Trail Area Health & Environment Program. September 9, 2014. British Columbia.

Pre-loaded fentanyl syringes

Penticton residents were warned of the risk of overdose after anecdotal reports of "pre-loaded fentanyl syringes; IMPORTANT COMMUNITY WARNING. --- Pre-Loaded Syringes of Toxic Substance.

Interior Health advised people who are considering using drugs experimentally or for recreational purposes to avoid the use of illegal drugs at this time according to Dr Sue Pollock.

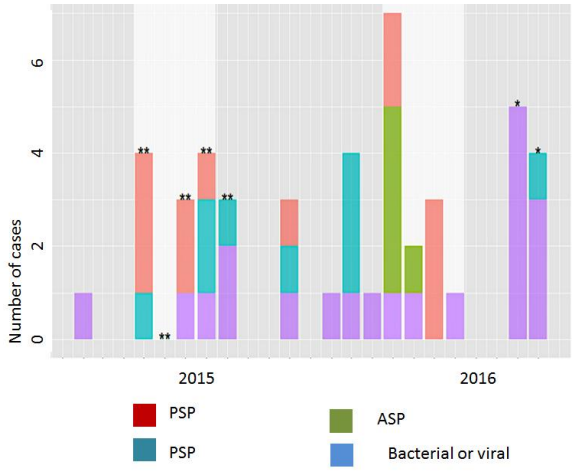
(LakeCountryCalendar-2018-02-21)

Vancouver Coastal Health

Drug and Poison Information Centre and Marine bio-toxin surveillance system in BC

The British Columbia Drug and Poison Information Centre has used its routine public health surveillance in near-real-time using the case study of its alerting system for illness related to the consumption of shellfish.

They have reported 79 cases between January 2015 and December 2016. Among them, 42% were not referred to health authorities. Authors concluded that surveillance capacity is evident within poison control data. (Wan, McIntyre et al. 2018)



Graph adopted from (Wan, McIntyre et al. 2018)

Widespread drug checking

358 cases died as a result of overdose deaths in Vancouver reached last year. Widespread drug checking should be made available to drug users who use alone (Dr. Patricia Daly recommends). (VancouverCourier-2018-01-31)

Fentanyl pipeline

A new Community Action Team (CAT) aims at reversing the opioid crisis in Richmond. Two issues have been more discussed; "Could the city soon see its first safe-injection site? How can authorities close the pipeline of fentanyl flowing in from China?"

Dr. Patricia Daly revealed that eighteen B.C. communities, including Richmond, will get about $83,000 each, on average, to form a "comprehensive community-level response" to the drug crisis. (RichmondNews-2018-02-05)

Cheap Fentanyl test strip

"It does encourage me to want to test the strips in other ways, like distributing them in the community and seeing how they work," says Mark Lysyshyn who has been studying how people use the strips in Vancouver's two supervised injection facilities. (PacificStandard-2018-02-23)

Preliminary result (May 2017) showed that when clients at Insite clinic test their drugs and got a positive result, they used less, which was associated with less overdosing. (PacificStandard-2018-02-23)

Vancouver Island Health

"Nothing happening is the worst-case scenario" Dr. Paul Hasselback referring to the fentanyl crisis. (NanaimoNewsNow-2018-02-27)

Where did overdose tragedy hit most in Vancouver Island?

--- Nearly 150 people fatally overdosed within four years in ***Nanaimo***. Island Health accuses City of Nanaimo of inaction according to the news. (NanaimoNewsNow-2018-02-27)

Port Alberni's overdose death rate 'highest on Island, and the good news is, in the latter half of 2017 the (fatality) rates seem to have come down says Dr Paul Hasselback. (AlberniValleyNews-2018-02-20)

Several specific trends related to tragedy are eye catching according to Dr. Richard Stanwick, such as the predominant number of **men** passing away and how often a fatal overdose happened inside a **private residence**. (NanimoNewsNow-2018-01-31)

--- ***Rural areas*** of Vancouver Island are being hit harder than ever.

--- Rates of overdose per 100,000 people both ***Central and North Island*** are higher actually than that's being experienced in Victoria" according to Dr Stanwick. (ICHEK-2018-01-31)

Overdose working groups in the communities that are named in the province's announcement in Vancouver Island will transition into community action teams and will need to develop action plans According to Dr. Charmaine Enns. (NanaimoNewsBulletin-2018-02-01)

Northern Health

The low rate of overdose deaths

This rate for 2017 was significantly lower than what the rate in the rest of the province. The probable reasons are as follows according to Dr. Andrew Gray. (MyPrinceGeorgeNow-2018-02-01)

- Doing a lot of important work.
- Getting the word out
- More accessible take home naloxone
- Investing in increasing access to treatment
- It might be luck, but there's no reason to think that we have fewer people who use drugs per capita than the rest of the province.

Action Teams

Prince George is one of the 18 communities lined up to Community Action Teams in response to the opioid crisis. While health authorities' welcome and will benefit the additional support from the Province, it's too early at this point to say how this team will look in Prince George. (CPKGToday-2018-02-02)

Anaphylactoid Reactions to Intravenous N-Acetylcysteine (Treatment for Acetaminophen Poisoning)

Authors reported anaphylactoid reaction in 528 (8.2%) of 6455 treatment courses, of which 398 (75.4%) were cutaneous.

504 (95.4%) reactions happened during the first 5 h.

Out of 403 patients administered any medication for these reactions, 371 (92%) received an antihistamine.

--- In this study, being female (adjusted OR 1.24 [95%CI 1.08, 1.42]) and having taken a single, acute overdose (1.24 [95%CI 1.10, 1.39]) were each associated with more severe reactions.

--- Higher serum acetaminophen concentrations were associated with fewer reactions (0.79 [95%CI 0.68, 0.92]). (Yarema, Chopra et al. 2018)

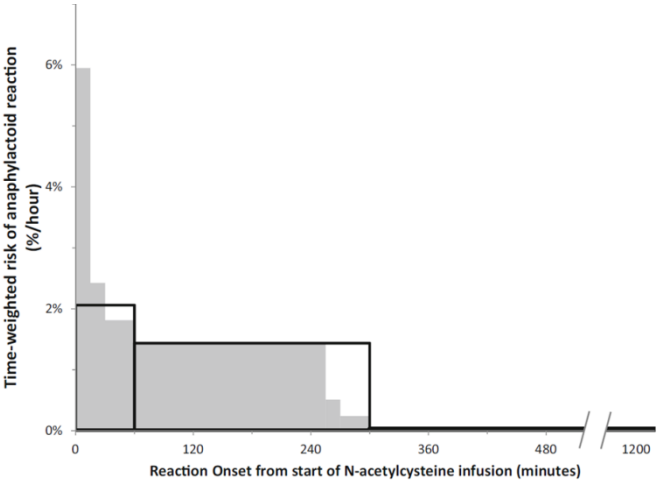


Fig. Time-weighted risk of developing an anaphylactoid reaction during the three phases of intravenous N-acetylcysteine infusion. The absolute risk for experiencing a reaction during each of the three dosing phases (150 mg/kg over 15 to 60 min, 50 mg/kg over 4 h, 100 mg/kg over 16 h) is shown, divided by the duration of the phase.

Thus, the area of each rectangle is proportional to the actual number of cases.

The large, open rectangles bounded by solid lines show the risk had all patients been administered the loading dose over 60 min and is therefore a very conservative estimate of the risk rate during the loading phase.

The gray rectangles show a closer (yet also conservative) approximation under the null hypothesis that the risk of reaction is independent of the duration of the loading phase. Figure adopted from (Yarema, Chopra et al. 2018)

Environmental Chemicals Exposure Induced Changes in Human Microbiome is a Health Risk at Population level

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

Microbiomes

The human microbiome includes all of the diverse microorganisms that inhabit the human body, as well as their genes and surrounding environmental conditions. Microbiotas such as bacteria, fungi, and viruses live in all organisms, from simple life forms and plants to humans, and can be commensal, symbiotic, or pathogenic.

Humans and their microbiomes have co-evolved to form an ecosystem. Microbiome effects on the human immune system, endocrine system and metabolism are well recognized. Microbial metabolic transformations in the human body includes reduction and hydrolysis with five major enzymatic families: azoreductases, nitroreductases, β-glucuronidases, sulfatases, and β-lyases.

Research has shown that perturbations in the human microbiome may cause human disease. Thus any factor, including exposure to environmental chemicals that affect the microbiome, could be health determinants.

What factors affect microbiome structure and function?

Microbial abundance and diversity increases through human development until adulthood (figure 1-A). Age, race, genetics, health status, physical condition, diet including early-life nutrition, geography, and *environmental chemical exposure*, affect microbiome structure and function.

In addition, variation in microbiome structure and function in turn changes its susceptibility to environmental-chemical exposure.

- Age and diet have an effect on gut microbiome;
- Local ecologic conditions such as water and nutrient availability have an effect on the skin microbiome;

Respiratory microbiome in lower respiratory is less than upper respiratory tract and far less than guts.

Mechanisms by which chemicals interact with microbiome

Five mechanisms by which environmental chemicals change human microbiomes are stated:

1. Direct effect; chemicals exposure may perturb the microbiome, which consequently may alter its capacity to metabolize chemicals.

Research has shown that supplementation of pancreatic digestive enzymes alter the composition of intestinal microbiota. (Nishiyama, Nagai et al. 2018)

2. Altered epithelial-barrier functions; Research shows that an intimate bidirectional relationship exists between the microbiota and epithelial cells in gut, for example.

Chemical exposure may alter epithelial permeability and integrity that may impact absorption, transport, and excretion of chemicals.

3. Direct chemical transformation; Microbial metabolic transformations such as reduction and hydrolysis could be affected by chemical exposure.

4. Transformation of host-generated metabolites; (Roberts, Wallace et al. 2013) (Wallace, Roberts et al. 2015) Host liver enzymes bio-transform certain chemicals, and their metabolites may be excreted in the gut, where the process could be reversed by microbial hydrolases.

Bio transformation of environmental chemicals that are subjected to elimination via β-glucuronidation is affected by microbiota via deconjugation reactions by gut β-glucuronidases.

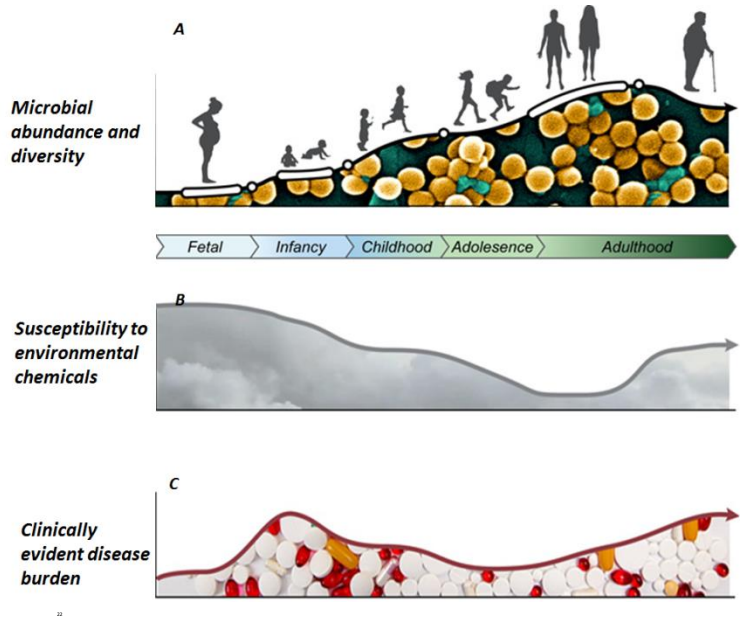
5. Altered expression of host-tissue metabolic enzymes and pathways. Gut microbiota contribute to regulation of host gene involved in chemical metabolism.

Microbial abundance and diversity increases as humans develop into adults (Figure 1 B).(National-Academies-of-Sciences 2018)

It is also recognised that susceptibility to environmental chemicals differs by age. In humans, metabolism is not fully developed at birth(Hines 2013) and pharmacovigilance for young children [critical developmental windows] is therefore essential.(Fabiano, Mameli et al. 2012)

The human microbiome structure and function are less varied and lighter in infants compared to adults (Figure 1 B).(National-Academies-of-Sciences 2018)

How should they be measured? What do you think?



Acknowledgement

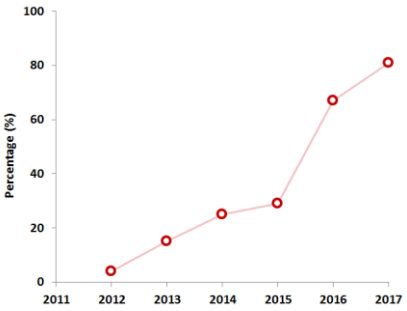
A recently published book "Environmental Chemicals, the Human Microbiome, and Health Risk - A Research Strategy" (National-Academies-of-Sciences 2018) by the National Academy of Sciences have been used extensively and is the backbone of this commentary.

Figure. Microbial abundance and diversity increases with development into adulthood (A). The pattern of susceptibility to environmental-chemical exposure differs in relation to the abundance and diversity of microbiome and is affected by developmental stage and baseline health status (B). Clinically evident diseases burden peak at infancy and old ages (C). Figure adopted from reference ((National-Academies-of-Sciences 2018)) with modification.

BCTOX's Toxicology Surveillance of Drug Overdoses and Forensic Toxicology in BC (i) – Jan 2018

Fentanyl Detected Illicit Drug Overdose Deaths in BC -

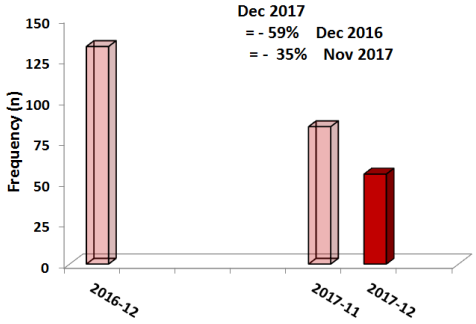
(2012- 2017 July) [BCTOX graph] Data from (BC Coroners Service 2017-12-31) (accessed Feb 20, 2018)

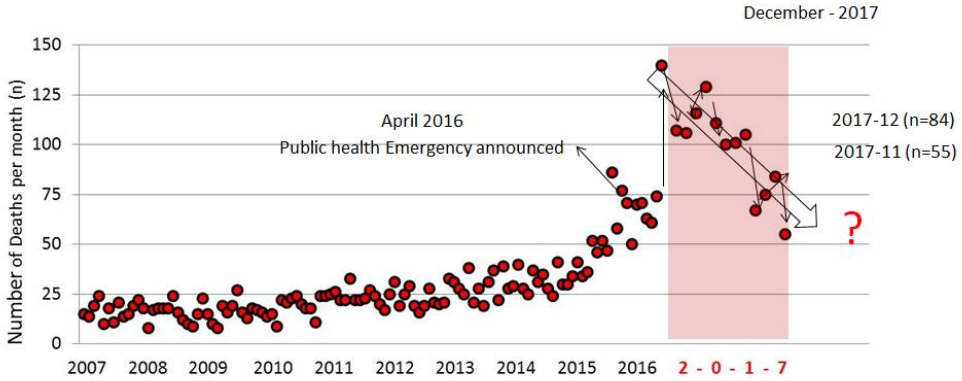


Estimation of Illicit drug overdose attributed deaths in BC in Dec 2017 (accessed Feb 20, 2018)

The number of Illicit drug overdose deaths in Dec 2017 was 55 (Data from BCCoronersService 2018-01-31), which is 59% lower than Dec 2016 and 34% lower than last month (accessed Feb 20, 2018)

[BCTOX graph]





Illicit drug overdose deaths per month in BC (2007 to December 31, 2017) [Data from BCCoronersService 2018-01-31]. **[BCTOX graph]** The pattern of overdose deaths suggests that the sharp increase in deaths has reached a plateau, and gradually decreasing. (accessed Feb 20, 2018)

Regulated opioid distribution program is a response to the opioid overdose crisis

Key points of a commentary (Tyndall 2018) is pasted below:

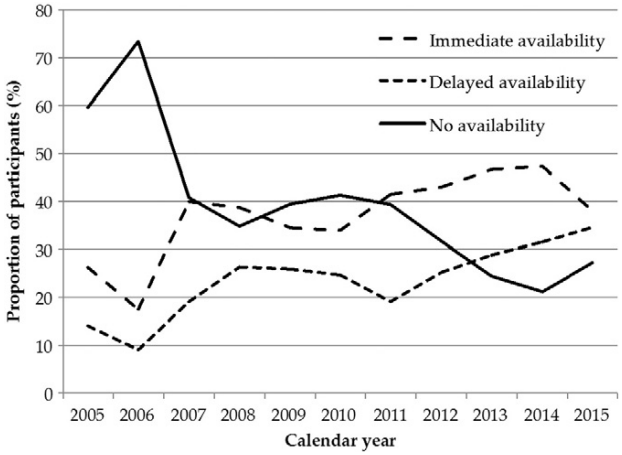
- The rapid rise of unintentional drug overdoses in Canada is directly related to the introduction of potent synthetic opioids into the illegal drug market.
- People who once had a secure source of pharmaceutical grade opioids or illegal heroin are now using drugs that are extremely potent and have unpredictable effects.
- Naloxone distribution, harm reduction programs and expanded access to drug treatment are critical first responses, but have limitations in reach and impact.
- A regulated, low-barrier distribution of pharmaceutical-grade opioids is a scalable intervention that could reduce harms &save lives.

Sheltering Risks

In new research from Victoria (Wallace, Barber et al. 2017), micro-environment level factors within emergency shelters responding to homelessness and substance use, and the macro-level influences that produce and sustain structural vulnerabilities were studied. Authors concluded that "when harm reduction is limited to the distribution of supplies such as clean equipment and naloxone, important principles of engagement and the development of trust necessary to the provision of services are overlooked with negative implications for service users."

Diversion of methadone is on raise in Vancouver 2005-2015.

In a new survey (Reddon, Ho et al. 2018), a total of 2092 participants of people who inject drugs, including 727 (34.8%) women, were studied. Calendar year (adjusted odds ratio [AOR] [CI] =1.21 (1.19-1.23) per year was independently and positively associated with reporting immediate availability of diverted methadone. (Reddon, Ho et al. 2018) [Figure adopted]



BCTOX's Toxicology Surveillance in BC (iii)
Shifting public interest

Shifts in public interest in the past 12 months

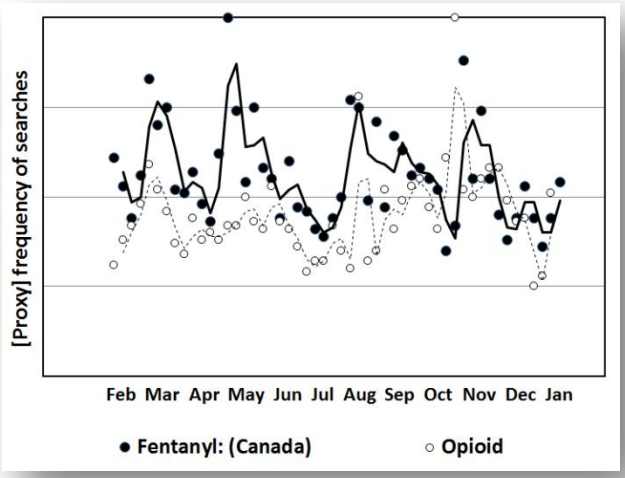
BCTOX is reporting the trends of public interest (Public-&-Professional searches) for major toxicology related issues in BC as a new surveillance system using google trends as surrogates of public attitude. The following graphs show the proxy frequency of searches for the keywords from Feb 2017 to Jan 2018. Each variable is compared with itself (the highest frequency of searches over a two week period in 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 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].

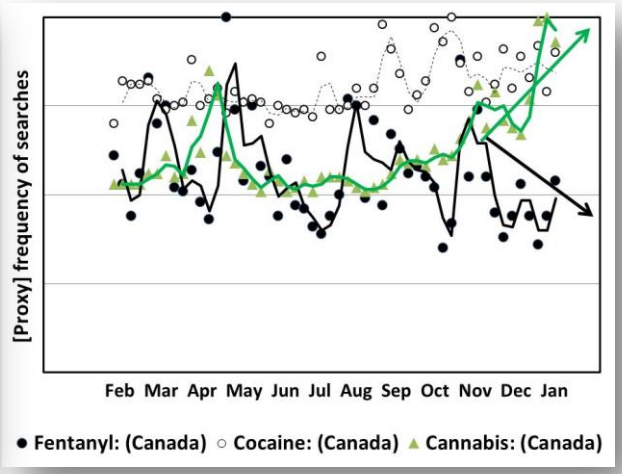
These findings are also not consistent when fentanyl searches are compared to "cannabis" and "cocaine" (figure B-1 and B-2)[right side]. This is despite the fact that fentanyl overdose induced deaths have remained relatively high, and as we are approaching the cannabis legalization.

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.

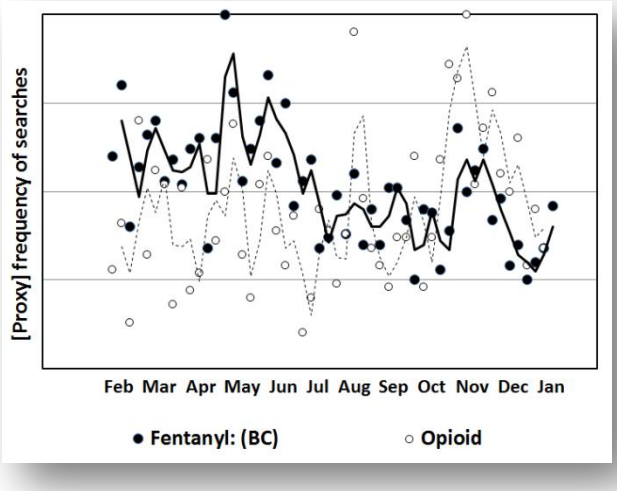
--- Public searches for "furanylfentanyl (Fu-F)" (less potent) and carfentanyl (more potent) analogs of fentanyl were not included.



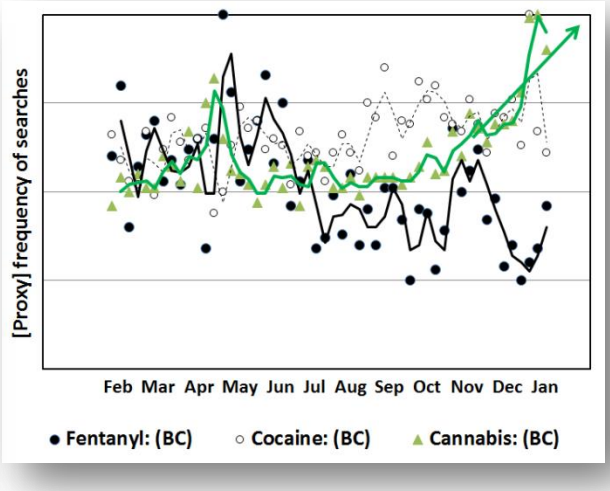
A-1. Canada



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 (v)

Toxic Exposure Mediated via PRODUCTS – BCTOX (selected items)

Selected Toxicological related product recalls / alerts **(Recalls-and-safety-alerts) - Updated 2018-02-26**

Date	Items --- Reasons to recall	
2018-02-04	Ventolin Diskus: One lot recalled as inhalers may not deliver the intended dose.--- GlaxoSmithKline Inc. is voluntarily recalling. Ventolin Diskus is a prescription drug used in adults and children 4 years or older to relieve and prevent bronchospasm due to asthma, chronic bronchitis and other chronic lung disorders. Ventolin Diskus (200 mcg salbutamol per blister (60 Dose) (DIN 02243115)) Lot 786G, Expiry 05 2019 Photo from the	
	Radiant Colors recalls Victor Portugal Lining Black tattoo ink (bacterial)	
2018-01-05	Expanded Recall: ITW Permatex recalls Permatex® Rust Dissolver Gel The recalled product does not meet the labelling and child-resistant packaging requirements for consumer chemical products as set out in the Consumer Chemicals and Containers Regulations, 2001.	
2017-12-28	The caps on some of the deck cleaner containers do not provide a complete seal. The cap does not offer sufficient resistance when opening the container impairing child-resistant characteristics.	

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

Selected Toxicological related food recalls in BC **Updated 2018-02-26**

Dates	Food (Company / Firm)	Reason to recall	
2018-02-13	Food Recall Warning (Allergen) - Paldo brand Seaweed Snack products and Lotte brand Kancho Choco Biscuit recalled due to undeclared peanut	Class 1	National
018-02-02	Food Recall Warning (Allergen) - Daisho brand "Seasoned Soup Base for Pot (Kimuchi Nabe Soup)" recalled due to undeclared shrimp and crab	Class 1	BC+

Bi weekly marine bio-toxin monitoring in West Coast BC in *whole 2017*

- ✓ ***Below*** regulatory limits Domoic acid [Amnesic Shellfish Poisoning] are reported. No cases of above regulatory limits were reported in the whole 2017.
- ✓ ***Above*** regulatory limits of Saxitoxin [Paralytic shellfish poisoning] concentrations were reported through 2017 with a pick in the warm months of the year.
- ✓ ***Below*** regulatory limits of Okadaic acid and dinophysis toxins [Diarrhetic Shellfish Poisoning] were reported mostly in the second half of the year

--- See next page for the details.

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

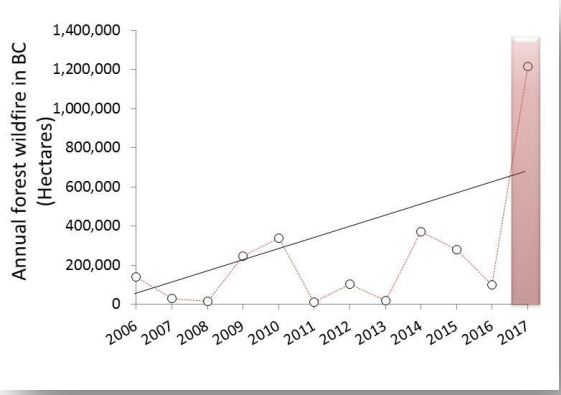
Wildfires in BC since 2006

Mean (min - max) wildfire in BC from 2006 to 2016 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% caused by people and 61% caused by lightning.

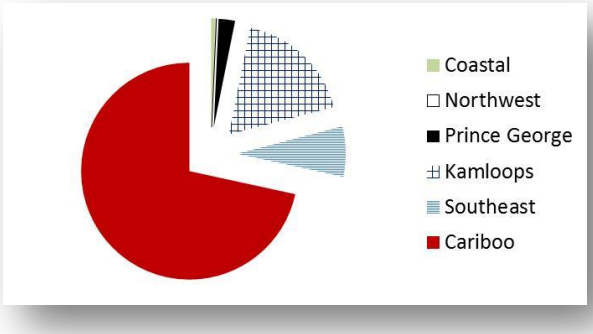
Total wildfire from April 1, 2017 to Dec 31, 2017 (current fiscal year) in BC is 12,154 km^2.



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

Depicts wildfire from April 1, 2017 to Dec 31, 2017 (current fiscal year) (1,215,494 hectares) 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 Dec 31, 2017 (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)

Climate change in BC

Provincial Audit on climate change

"The province is also increasing the carbon tax by $5 per ton a year, starting April 1, and that will help to meet both the new 2030 target and the 2050 target of 80 per cent below 2007 levels according to Environment Minister George Heyman. (CBCNews-2018-02-15)

"British Columbia has no clear plan to prevent threats such as wildfires, flooding and drought as it works to adapt to the risks posed by climate change, the province's auditor general says." (CBCNews-2018-02-15)

According to the province's auditor general Carol Bellringer, a comprehensive risk assessment is needed as a crucial step in adapting to climate change because it provides decision makers with clear information for allocating funds and planning for the future.

"***Gaps*** exist in the northern regions of the province and at high elevations. In addition, there are gaps in hydrometric and groundwater monitoring in the province." (MetrovVan-2018-02-15)

Decreases in beetle body size and Climate change

Researchers from UBC have used datasets spanning 30 to 100 years to examine whether the body size of 22 wild-caught beetle species has changed over time. They also correlate the changes increased temperatures

They found that 95% of laboratory-reared beetles decreased in size with increased rearing temperature, with larger-bodied species shrinking disproportionately more than smaller-bodied beetles. (Tseng, Kaur et al. 2018)

Climate change leads to increasing population density and impacts of a key island invader

A joint study with UBC researchers has shown that climate change creates ameliorating conditions for invasive rodents on sub-Antarctic islands, and the severity of their impacts will increase. (McClelland, Altwegg et al. 2018)

Alternative views!

Climate change opens doors for Okanagan agriculture

A long-term warming trend is leading to the potential suitability for fruit crop agriculture extending north beyond the Okanagan Valley. (BCLocalNews-2018-02-28)

Toxic exposure mediated via WATER in BC

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 Feb 27, 2018)

Date	Name	Source	Nearest Community	Spilled Content
2018-02-24	HMCS Calgary Fuel Spill	Unconfirmed	Strait of Georgia	Fuel
2018-01-25	Overturned Tanker Truck near Grand Forks	Tanker Truck	Grand Forks, B.C.	Fuel
2018-01-22	Ethanol Fire in Port Coquitlam Rail Yard	Tanker Truck	Port Coquitlam, B.C.	Ethanol
2018-01-19	Coal Train Derailment near Hazelton	Rail	Hazelton, B.C.	Coal

Comment on:

Dr Aaron Shapiro has commented on "Celebrities who died of opioid overdose!" BCTOX 2018 Jan 3(1): 189. BCTOX would like to express its appriciation for his contribution. Thank you Aaron!

Singer Tom Petty's death was also attributed to opioid (fentanyl) use. (BusinessInsider-2018-01-19) Tom Petty suffered from knee and hip problems and had been prescribed painkillers. He was passed away suddenly last October.

The cause of his death was unclear. The coroner official report in January implies that he died of an accidental drug overdose that included opioids (for pain) and benzodiazepines (for anxiety) according to media. (BusinessInsider-2018-01-19)

Announcements - BCTOX

50th Annual Symposium of the Society of Toxicology of Canada, in Toronto, December 10 to 12, 2018.

Toxic exposure mediated via SOIL in BC

Radon – North Shore

Anne-Marie Nicol suspects Sea-to-Sky, North Shore could be home to high-risk radon. Radon gas forms when uranium erodes from the soil. (CBCNews-2018-02-20)

People living in homes on top of contaminated soil are at risk because the radioactive gas can seep inside. According to Health Canada, radon kills 3,200 Canadians annually.

Radon exposure on Vancouver's North Shore and the Sea-to-Sky corridor is a potential health hazard. She recommends BC authorities to change provincial building codes to reflect the risk. (CBCNews-2018-02-20)

The B.C. Building Code separates the province into Area 1 and Area 2, which have different construction requirements for mitigating radon exposure. (Government of British Columbia)- Adopted from (CBCNews-2018-02-20)

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.

Upcoming Toxicology jobs in BC (February 2018)

Hygiene Advisor

http://pretivm.applynow.net.au/jobs/96203-industrial-hygiene-advisor

Occupational hygiene advisor, health safety and prevention-Interior Health

https://jobs.interiorhealth.ca/job/-/-/602/7139043?ss=paid

Solve the mystery: What is the first documented disease in modern history of BC? In your view, what could be the potential reason(s) for underreporting Paralytic Shellfish poisoning (PSP)?

Take a guess (or confirm), and email back your response to be entered in the BCTOX drawing for $20 gift card. (Deadline March 10, 2018)

- 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 continuation of previous BCTOX's report on Saxitoxin that causes Paralytic Shellfish Poisoning (PSP) in the past 6 issues, a more detailed evaluation of the prevalence and simulation is provided.

History of Paralytic Shellfish Poisoning in BC

First, let's celebrate the life and expedition of Captain George Vancouver (1757 - 1798)(figure 1). Second, Archibald Menzies (1754 - 1842) Scottish surgeon and naturalist, who scientifically documented the expedition in his diary (figure 2-4). [I could not find any documentation for Menzies in Vancouver's museums, but information is available from the UK sources].

Mr. (Dr.) Menzies reported that three members of one of the Captain Vancouver's parties exploring Mathieson's Channel on the coast of British Columbia were stricken, probably from eating blue mussels (June 17, 1793) (figure 5). He explained in detail the clinical findings and outcome. His accounts are probably the first scientific documentation of any disease from modern history of BC.

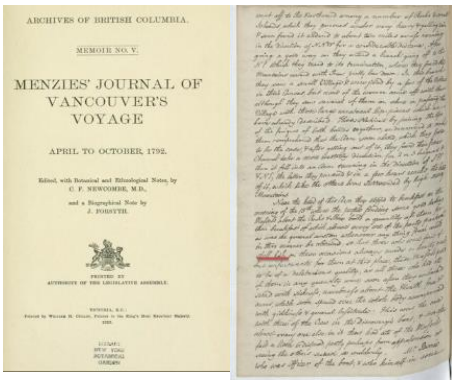
Figure 1. Captain George Vancouver (1757 – 1798) Courtesy of Jane Lougheed, Museum of Vancouver. --- You may also pay a visit to his monument in front of Vancouver City Hall at Cambie and 12th St., Vancouver (150 meters from BCCDC).

Figures 2. Archibald Menzies (1754 - 1842) Scottish surgeon and naturalist (Photo from Wikipedia).

History of Paralytic Shellfish Poisoning in BC

Similar reports exist from Alaska (Russian America) in the 19th century. Documentation from Heinrich Johan Holmberg, of Finland who worked for the local government of Russian America produced sketches, by documenting his experience and his talks with First Nation Populations. He documented:

These creatures [mussels], whether in special seasons or in certain localities, are sometimes poisonous. First Nation Populations recall and named a place "Strait of the Victim" (Pogibshih proliv, Погибших проливов (?), or Peril Strait), according to his reports. [I could not find any other related sources regarding *Strait of the Victims*. Searches in Russian documents refer to another place in the Crimean Peninsula on the northern coast of the Black Sea]



Figures 3-5. Mr. (Dr) Menzies' diary referring to Shellfish poisoning. A jar that *may* have been used by Archibald Menzies according to the records. Courtesy of Wendy Nichols, Museum of Vancouver.

Saxitoxin

Guanidinium toxins, such as saxitoxin (STX), tetrodotoxin (TTX) and their analogs, are naturally occurring alkaloids with divergent evolutionary origins and biogeographical distribution, but which share the common chemical feature of guanidinium moieties.(Bragg, Garrett et al. 2018)

Figure 6. Natural sources of guanidinium toxins (Shellfish and Dinoflagellate Gonyaulax Catenella). Photos adopted from (Bragg, Garrett et al. 2018)

TOXIN: A group of 21 structurally related neurotoxins

CAUSATIVE ORGANISMS: Red tide: dinoflagellate, Marine Dinoflagellates, Cyanobacteria from fresh water

VECTOR: Bivalve shellfish, --- Pufferfish

FATALITY RATE: 1% to 14%

TIME TO ONSET OF SYMPTOMS: Minutes to hours (> 24h*)

DOSE: Mouse LD50; NTRAPERITONEA 8 mcg/kg-ORAL 263 mcg/kg (RTECS , 2002)

- Lethality; 0.5 mg is potentially lethal (Acres & Gray, 1978) [7 mcg/kg]

MECHANISM: Sodium channel blocker (among others)

DIFFERENTIAL DIAGNOSIS

- Other marine toxin poisonings and Scombroid fish poisoning,
- Pesticide poisoning (e.g. OP)

Microbial food poisonings and Food allergies.

Prevalence of Saxitoxin exposure in BC

Next page

Saxitoxin levels from 2002 to 2016 – BC

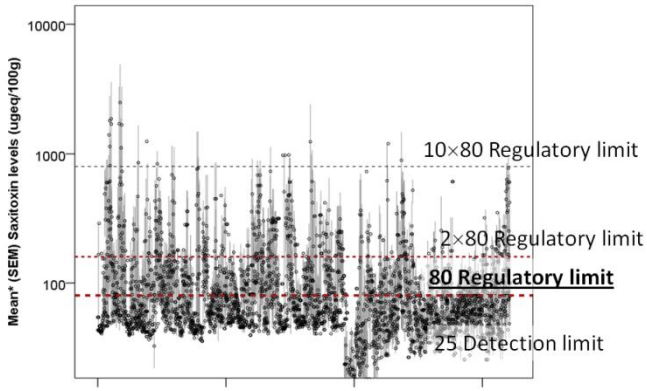


Fig 7.Saxitoxin levels from 2002 to 2016, n=43594 (Data fromCFIA)

Saxitoxin Levels just 2017 – BC

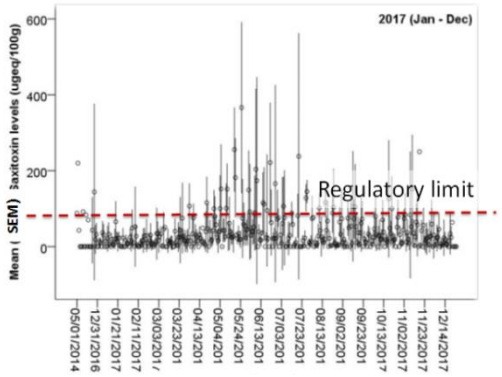


Figure 8. Saxitoxin levels in 2017, n= 3878 (Data from CFIA)

Clinical manifestation and case definition

Although dependent on the references, minor differences exist for clinical manifestations of paralytic shellfish poisoning, the following sketch is probably cover the diagnosis. A "probable case" is easy to define clinical findings within 12 hours of consumption.

While manifestation of severe cases are prominent and include ataxia, dysphagia, mental status changes, flaccid paralysis respiratory failure, etc., mild cases may be presented by numbness and tingling that may be presented from the face to legs, and history of exposure.* maybe gastrointestinal findings.

Clinical

Mild cases

- Numbness and tingling (ranged from face to legs)
- Maybe gastrointestinal

Severe cases

Ataxia, dysphagia, mental status changes, flaccid paralysis respiratory failure, etc.

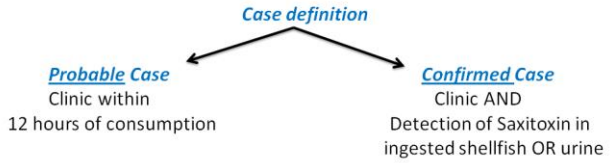


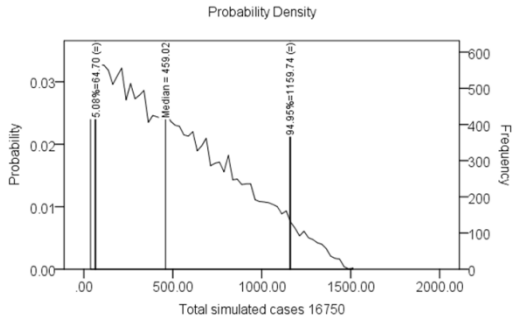
Figure 9. Paralytic Shellfish Poisoning Clinical findings and case definition. (BCTOX)

Reports of PSP in BC in the past few years

Potential under reporting of Paralytic shellfish poisonings in BC - Simulation of data. Around 17 probable cases of PSP are reported to Drug and Poison Information Centre annually. (Wan, McIntyre et al. 2018) Controversially, the prevalence of PSP is underreported in BC!

Simulation data

Simulation (16,500 subjects included) suggests that frequency may range from a few to 1500 cases annually in the Province, and also the probabilities of higher estimates are lower - subject to assumptions & limitations. In this approach, median estimation is 450 cases (Figure 10, below).



<64.70	64.70 - 1159.74	>1159.74
5%	90%	5%

FACTS

1. Almost in any given time points in 2017, Saxitoxin levels in shellfish in BC has been above the regulatory limit.

2. In the majority of any given time points from 2002 to 2016, Saxitoxin level in shellfish in BC has been above the regulatory limit.

3. The extent of higher levels is considerable. As a result the severity and probability of the disease are expected to be higher.

4. The number of PSP has increased 4 times in North America and 13 times in the world (comparing 1970 and 2015)

5. Simulating for potential underreported cases may suggest a median of 450 cases per year in BC (subject to assumption and limitation)

Figure 11 (above) implies that the pathway for has been and is operable since 2002 in BC. Many facts support the presence of PSP.

PSP is under reported (?), the reason is probably due to limited experience with clinical findings (?) --- Communication with physicians is needed, in particular for First Nation populations and Coastal residents.

Figure 11. Pathway leading to paralytic shellfish poisoning.

Question

What do you think? Is Paralytic Shellfish Poisoning underreported in BC? What are the potential reasons?

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 March 10, 2018)

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