February 2018

BC Centre for Disease Control
An agency of the Provincial Health Services Authority

LM LABS

LABORATORY TRENDS

A Report from the BCCDC Public Health Laboratory

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Issues: www.bccdc.ca/publichealthlab

Personnel updates at the Public Health Laboratory

Retirement of Amelia Trinidad

We would like to note the retirement of Amelia Trinidad after 31 years of dedicated work at the BCCDC Public Health Laboratory (PHL). Amelia has had a full career, starting in the Parasitology Section and then through the General Bacteriology and Enteric Bacteriology Departments as a medical technologist. She then became a supervisor for the Food Poisoning Section and later briefly for the Mycobateriology/TB and Mycology Sections. From 2002-2006, Amelia became our first quality manager at the BCCDC and then our chief technologist from 2006-2012, where she was instrumental in the laboratory achieving accreditation through the College of Physicians and Surgeons and the Diagnostic Accreditation Program. The role would evolve to become the BCCDC PHL laboratory manager where Amelia oversaw the overall day-to-day operations and continue her strong leadership with a focus on quality. We wish Amelia well in her retirement and want to express our gratitude for her many years of service.

New Laboratory Manager: Quantine Wong

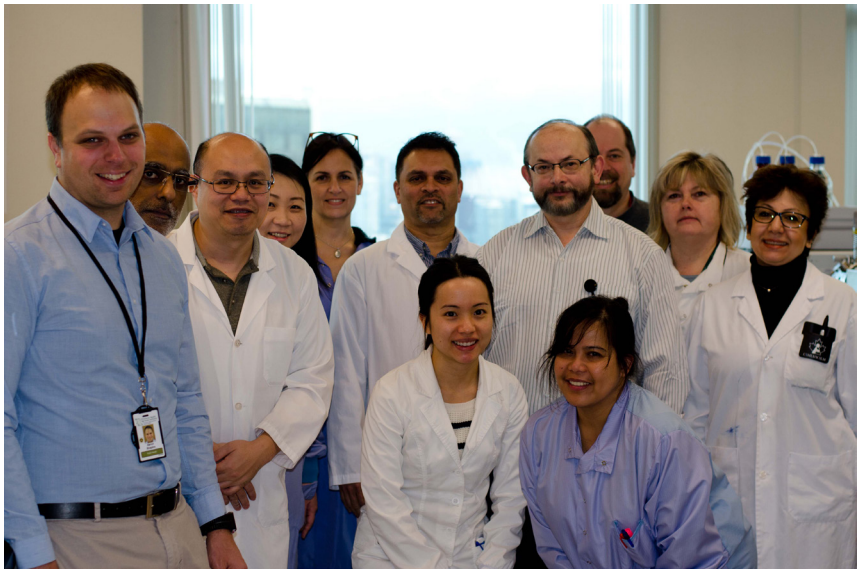
Quantine Wong is the new BCCDC PHL laboratory manager and brings over 37 years of experience to the public health laboratory. Starting as a summer student in the Non-Viral Serology department, she became a medical technologist in the Parasitology/TB/Mycology section, research technologist, and then a medical technologist supervisor in Parasitology in 1986. Quantine then became section head in Parasitology in 1998, where she helped establish various molecular and culture methods and telepathology. In 2001, Quantine also became section head for the Zoonotic Diseases and Emerging Pathogens Program. Quantine became the site supervisor at BCCDC PHL in 2015 while also providing leadership at the Call Centre and the Provincial Toxicology Centre. Quantine is one of Canada's experts in parasitology and is well-known to clinical parasitology circles in BC and other provinces, having taught many students, technicians and residents.

New Site Supervisor: Brian Auk

We are also pleased to announce that Brian Auk has been promoted to the role of site supervisor. Brian first worked as a co-op student at the BCCDC PHL in the Vector borne Disease Section (now known as Zoonotic Diseases & Emerging Pathogens), working extensively on Lyme disease. Between 2005 and 2006, he went on to do research for UBC conducting molecular-based research studies. In 2006, Brian joined the BCCDC PHL as a medical technologist in the Bacteriology and Mycology Section. He next became one of the technical coordinators in Environmental Microbiology in 2007, eventually becoming the department's team lead in 2013. In 2016, Brian became the team lead for the Virology Program and Molecular Microbiology & Genomics Program at the BCCDC PHL. As site supervisor, Brian will support Quantine in managing the operations of the BCCDC PHL, Provincial Toxicology Centre and Lower Mainland Call Centre.

Personnel updates at the Provincial Toxicology Centre

The Provincial Toxicology Centre is now another arm of the public health laboratory, with Dr. Mel Krajden providing medical leadership and Dr. Karen Mooder providing administrative oversight. In the latter part of 2017 a new organizational structure was established to build capacity in the face of the current opioid crisis and to enhance quality. A new Scientific Director, Dr. Sergei Likhodi, and an Associate Scientific Director, Dr. Aaron Shapiro were hired to provide scientific toxicology leadership. Dr. Likhodi was previously a clinical assistant professor at Memorial University Of Newfoundland and a Clinical Biochemist with Eastern Health, the largest health authority in the province. In Eastern Health Dr. Likhodi oversaw routine clinical chemistry as well as specialized mass spectrometry testing such as therapeutic drug monitoring, toxicology, clinical diagnostics and newborn screening for inborn errors of metabolism for the province. He was previously also a clinical biochemist at the Children's Hospital of Eastern Ontario and an assistant professor at the University of Ottawa. Dr. Shapiro came from the Ontario Centre of Forensic Sciences and as a forensic toxicologist, provided leadership and expertise in forensic toxicology.



Provincial Toxicology Centre Staff: (From left to right) Aaron Shapiro, Sunil Lai, Rick Yip, Jeanne Chang, Lisa Tripodi, Mahmood Khan, Ashley Wong, Sergei Likhodi, Neriza Reyes, Dennis Friesen, Lise Quickfall, Zara Naeimipour. *Absent*: Brian Fowler, Dennis Burich, Chongjian Zhao

Case Report: Unintended Consequences of Codeine Abuse

Submitted by: Dr. Aaron Shapiro, Provincial Toxicology Centre

Codeine is an opiate that is produced naturally in the opium poppy (*Papaver somniferum*). When administered, some of the drug is metabolized to morphine, which accounts for the majority of its narcotic effects. The Narcotic Control Regulations (C.R.C., c. 1041) of the *Controlled Drugs and Substances Act 1996*, permits pharmacies to sell codeine without a prescription so long as it does not exceed a dose of 8 mg per tablet and contains at least two additional non-narcotic medicinal ingredients at a regular dose (1). Under this regulation, pharmacies across Canada can legally sell a formulation containing 8 mg Codeine, 15 mg Caffeine, and 300 mg Acetaminophen, such as Tylenol No. 1. This cheap and legal source of opiate can be attractive to some opioid abusers because of its ease of access and perceived safety. However, the low doses of codeine necessitate administration of ten or more tablets at a time, which can lead to acetaminophen toxicity.

Table 1. Toxicological findings in post-mortem specimens from suspected acetaminophen-related death, Provincial Toxicology Centre.

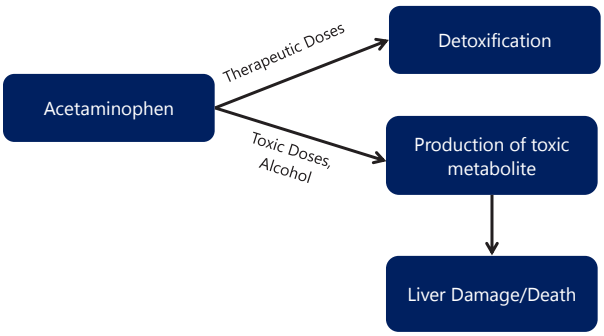
Analyte	Concentration
Ethanol	0.10 g/100 mL
Codeine	0.20 mg/L
Caffeine	33 mg/L
Acetaminophen	120 mg/L
Diphenhydramine	Detected
Gabapentin	Detected

Acetaminophen is an antipyretic and analgesic medication. When taken as prescribed, it is efficiently conjugated to a non-toxic metabolite and eliminated. However, high doses of acetaminophen can saturate the conjugation pathway, leading to the formation of a toxic reactive intermediate. Formation of the reactive intermediate can be accelerated through consumption of alcohol by inducing the drug metabolizing enzyme cytochrome P450 (CYP) 2E1 (2). Formation of the reactive intermediate can bind irreversibly to liver proteins and cause tissue damage. In cases of severe liver damage, acetaminophen toxicity can lead to liver failure and death (Figure 1).

In a recent unexplained death, an individual with a history of abusing alcohol and Tylenol No. 1 was found unresponsive after several days of feeling gravely ill. Results of post-mortem toxicology testing performed in peripheral blood are summarized in Table 1. The reported blood ethanol concentration has been associated with a moderate degree of intoxication. Codeine concentration is within a therapeutic range. Caffeine is within a range where toxic effects have been reported but below a concentration associated with fatalities. Acetaminophen concentration has been associated with toxicity but below a level normally associated with fatalities. Acetaminophen overdoses are typically characterized by latent liver damage, which presents after several days without symptoms. Liver failure and subsequent death can occur within 6 days (3). Therefore, the concentration of acetaminophen could have been higher prior to death.

The drug findings in this case suggest the cause of death could be liver failure arising from chronic acetaminophen toxicity. This is a cautionary tale of the unintended consequences of abusing licit drugs.

Figure 1. Mechanisms of acetaminophen metabolism following therapeutic and toxic dosing.



References:

1. Narcotic Control Regulations (C.R.C., c. 1041). *Controlled Drugs and Substances Act.* Available at: http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.,_c._1041/FullText.html. (Accessed: 2nd February 2018)
2. Girre, C. et al. Assessment of cytochrome P4502E1 induction in alcoholic patients by chlorzoxazone pharmacokinetics. 1994. Biochem Pharmacol 47: 1503–1508.
3. Prescott, L F. Paracetamol overdosage. Pharmacological considerations and clinical management. 1983. Drugs 25: 290–314.

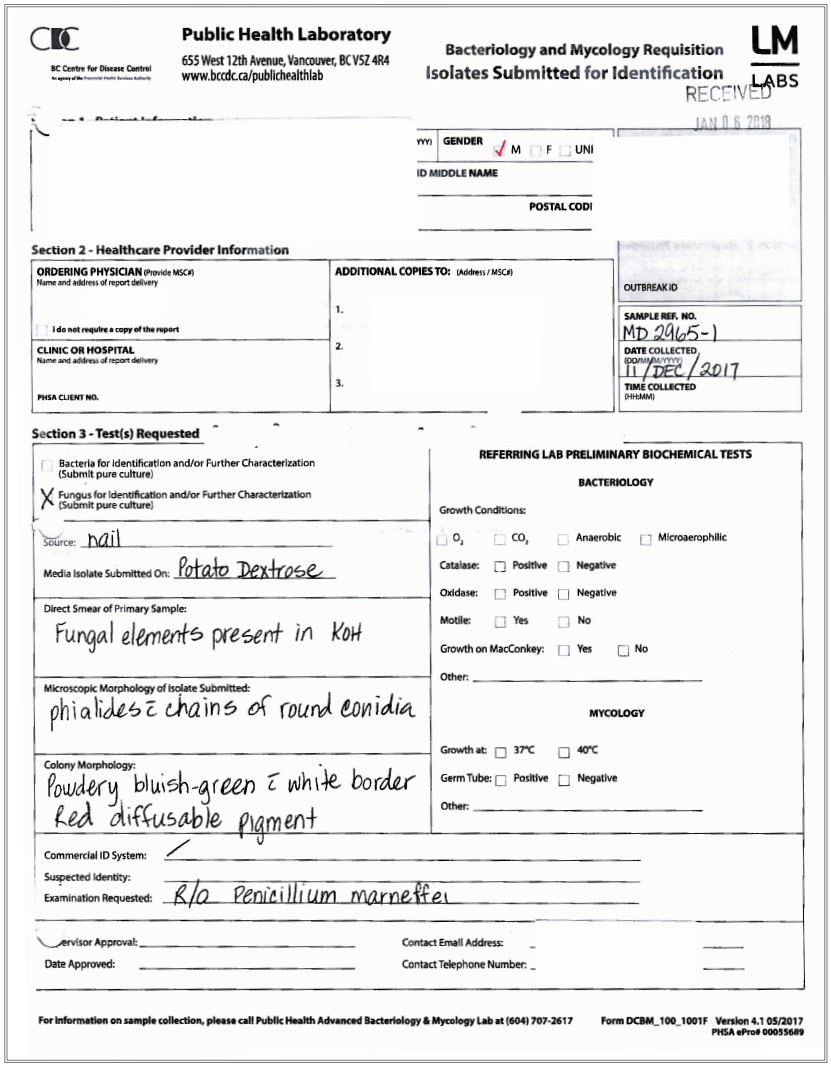
Example of a Correctly Filled Out Bacteriology & Mycology Requisition for an Isolate Submitted for Identification

The BCCDC PHL supports frontline laboratories across the province. To perform appropriate testing and further characterization, we depend on our submitting laboratories to provide the results of their own microbiological work up.

Figure 2 is an example of a perfectly filled out requisition for fungal identification with information on the isolate source, media the isolate was submitted on, smear results and morphological traits. These preliminary findings in addition to microscopy and culture tests performed by the BCCDC PHL Advanced Bacteriology & Mycology Program allowed for a confirmed final interpretation without any need for follow up telephone calls.

This is example demonstrates that results of previous testing assists appropriate follow up reference work. Submission of properly filled our requisitions with complete patient and physician demographics, clear test requests and necessary clinical history ensures that appropriate and timely laboratory testing is performed.

Figure 2. Sample Bacteriology and Mycology requisition for isolate submission.



BC Centre for Disease Control
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www.bccdc.ca/publichealthlab

Bacteriology and Mycology Requisition
Isolates Submitted for Identification

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RECEIVED
JAN 0 6 2018

YYY) GENDER ✓ M F UNI
ID MIDDLE NAME
POSTAL CODI

Section 2 - Healthcare Provider Information

ORDERING PHYSICIAN (Provide MSC#)
Name and address of report delivery
I do not require a copy of the report

CLINIC OR HOSPITAL
Name and address of report delivery

PHSA CLIENT NO.

ADDITIONAL COPIES TO: (Address / MSC#)
1.
2.
3.

OUTBREAK ID

SAMPLE REF. NO.
MD 2965-1

DATE COLLECTED (DD/MM/YYYY)
11/DEC/2017

TIME COLLECTED (HHMM)

Section 3 - Test(s) Requested

☐ Bacteria for Identification and/or Further Characterization (Submit pure culture)
X Fungus for Identification and/or Further Characterization (Submit pure culture)

Source: nail
Media Isolate Submitted On: Potato Dextrose

Direct Smear of Primary Sample:
Fungal elements present in KOH

Microscopic Morphology of Isolate Submitted:
phialides & chains of round conidia

Colony Morphology:
Powdery bluish-green & white border
Red diffusable pigment

REFERRING LAB PRELIMINARY BIOCHEMICAL TESTS

BACTERIOLOGY

Growth Conditions:
☐ O_2 ☐ CO_2 ☐ Anaerobic ☐ Microaerophilic
Catalase: ☐ Positive ☐ Negative
Oxidase: ☐ Positive ☐ Negative
Motile: ☐ Yes ☐ No
Growth on MacConkey: ☐ Yes ☐ No
Other:

MYCOLOGY

Growth at: ☐ 37°C ☐ 40°C
Germ Tube: ☐ Positive ☐ Negative
Other:

Commercial ID System: /
Suspected Identity:
Examination Requested: R/o Penicillium marneffei

ervisor Approval:
Date Approved:
Contact Email Address:
Contact Telephone Number:

For information on sample collection, please call Public Health Advanced Bacteriology & Mycology Lab at (604) 707-2617

Form DCBM_100_1001F Version 4.1 05/2017
PHSA ePro# 00055689

Neisseria meningitidis Trends

Neisseria meningitidis is the infectious agent of meningococcal disease. *N. meningitidis* is a reportable disease to public health. Bacterial isolates recovered from sterile sites are routinely sent to BCCDC PHL for serogrouping. Between 2008-2017 there were 331 isolates of *N. meningitidis* submitted by frontline microbiology laboratories for identification/further work at the BCCDC PHL. These isolates get further classified into serogroups through bacterial agglutination using sero-specific antisera.

In BC, serogroups B (n=79; 38%) and Y (n=62; 30%) are predominantly associated with infections (Figure 3).

Between 2015-2016, the number of *N. meningitidis* cases in BC were lowest, but rebounded to 31 cases in 2017 with the majority being serogroup W (n=13; 42%) (Figure 3). Since 2008, older adults (40-64 years) accounted for 24-45% of the number of cases of *N. meningitidis*. In 2017, there was greater distribution of cases from a range of age groups with the highest incidence in cases in the following age groups: 20-29 years (n=9; 29%) and 10-19 years (n=7; 23%) (Figure 4).

The increase in the number of cases in 2017 along with the change in predominant serogroup and age distribution reflects disease transmission in two Interior Health Authority community outbreaks that led to widespread immunization campaigns focused on youth 15-19 years old. BCCDC PHL is working with the health authority and the National Microbiology Laboratory to further characterize the outbreak strains using genomic methods.

Figure 3. Total cases and top serogroups of *Neisseria meningitidis*, collected 2008-2017, Advanced Bacteriology & Mycology Program, BCCDC PHL.

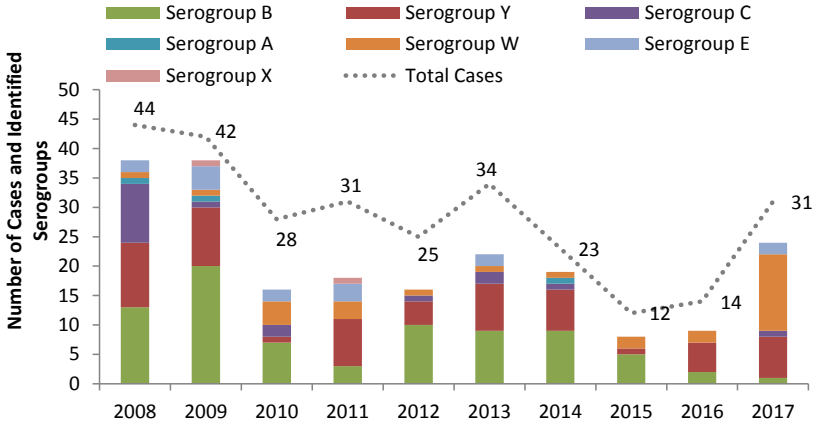
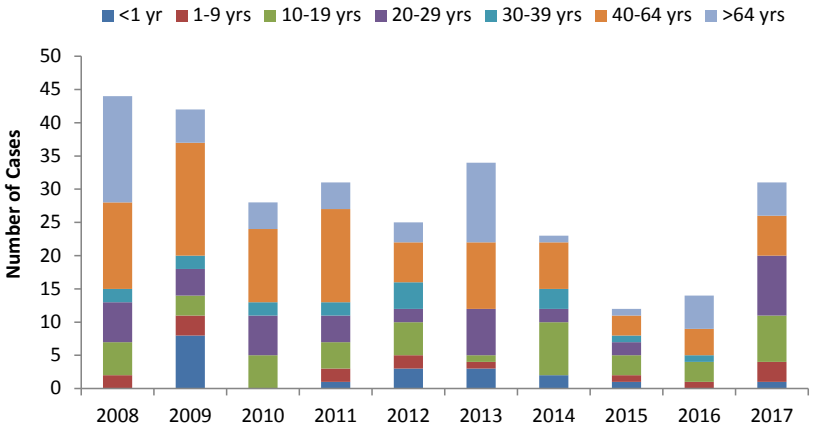


Figure 4. Number of cases of *Neisseria meningitidis* by gender, 2008-2017, Advanced Bacteriology & Mycology Program, BCCDC PHL.

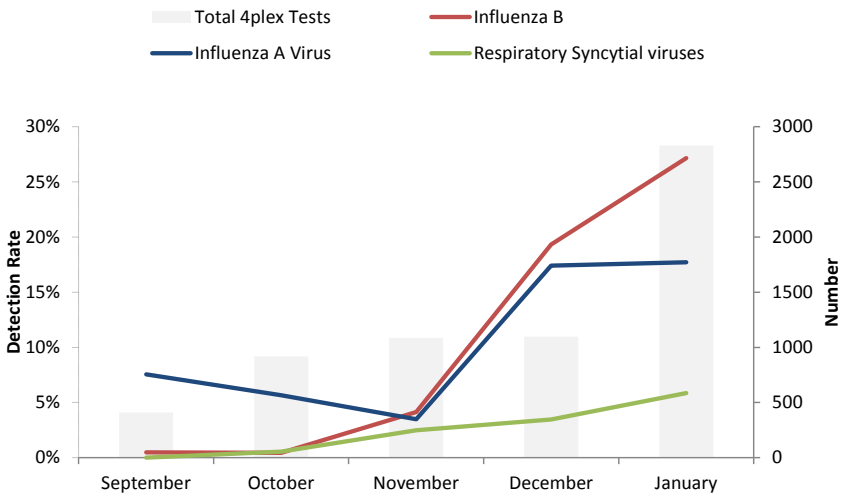


Respiratory surveillance

The Virology Program at the BCCDC PHL has been engaged in testing for a heavy influenza season thus far. Starting in October when test volumes more than doubled from what was received in September, test volumes more than tripled in January compared to what was tested in the previous months (Figure 5). This season, not only has there been increased detection of influenza A (attributed mainly to subtype H3) from November to January (3% to 18%) but at the same time there also has been increased influenza B detections (4% to 27%) (Figure 5). The early appearance of influenza B and co-circulation with influenza A is markedly different from its usual pattern of emerging later on in the season after influenza A has subsided. This phenomenon has been seen across the country as reported by provincial laboratories through FluWatch (1).

Findings from interim estimates of vaccine effectiveness from participating provinces of the Canadian Sentinel Practitioner Surveillance Network (CSPSN) suggest low vaccine efficacy against influenza A(H3N2) and moderate vaccine efficacy against influenza B (2). The study also revealed a nearly homologous genetic profile of sequenced influenza A(H3N2) viruses compared to both the CSPSN findings of the 2016/17 season as well as the 2017 sequences from Australia where more genetic variation was present, which may have implications on vaccine composition (2).

Figure 5. Respiratory virus detection rates by result month, 2017-18 season, Virology Program, BCCDC



References:

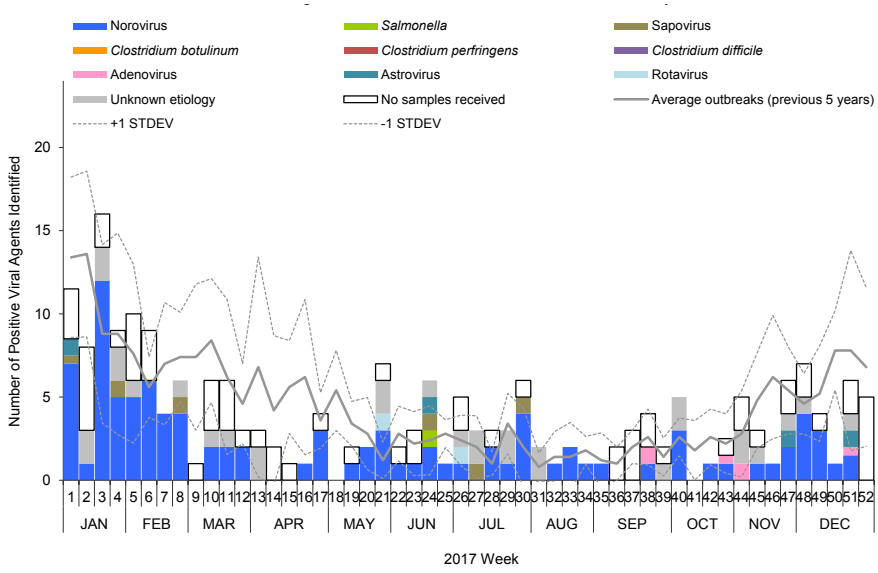
1. Influenza weekly reports 2017-18 season (Public Health Agency of Canada). Available at: https://www.canada.ca/en/public-health/services/diseases/flu-influenza/influenza-surveillance/weekly-reports-2017-2018-season.html. (Accessed Feb 6, 2018)

2. Skowronski DM, Chambers C, De Serres G, Dickinson JA, Winter A-L, Hickman R, Chan T, Jassem AN, Drews SJ, Charest H, Gubbay JB, Bastien N, Li Y, Krajden M. Early season co-circulation of influenza A(H3N2) and B(Yamagata): interim estimates of 2017/18 vaccine effectiveness, Canada. 2018. Euro Surveill. 2018;23(5).

Gastrointestinal outbreaks

In December there were 20 gastrointestinal (GI) outbreaks investigated by the BCCDC PHL (Figure 6). Outbreaks were investigated from 10 (50%) longterm care (LTC) facilities, seven (35%) daycares/schools, one (5%) restaurant, one (5%) hospital and one (5%) other event. Samples were received from half of these outbreaks with norovirus detected in 6 (60%) (three from LTC facilities, one from a restaurant outbreak, one from a hospital and one from an event) (Figure 6). Astrovirus was detected from a sample from a daycare outbreak while another daycare had a patient with both norovirus and adenovirus positive in their sample.

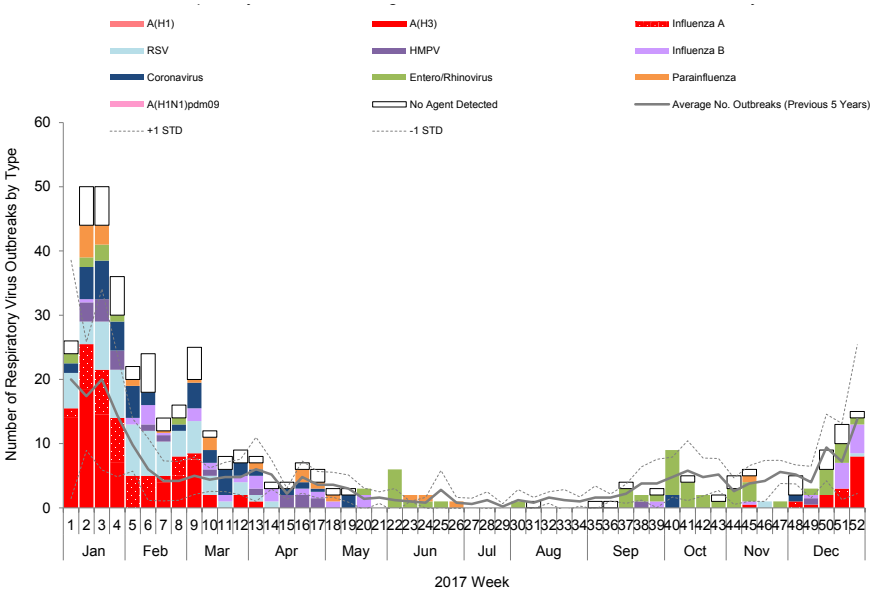
Figure 6. Gastrointestinal outbreaks investigated in 2017, Environmental Microbiology, Public Health Advanced Bacteriology & Mycology, Parasitology and Virology Programs, BCCDC PHL. The data available are from outbreaks in which the BCCDC PHL has been notified. Some acute care microbiology laboratories are also testing for norovirus in the province and these data may not include outbreaks from all health authorities.



Respiratory outbreaks

In December there were 42 influenza-like illness outbreaks investigated by the Virology Program of BCCDC PHL. Specimens from these outbreaks were submitted from 39 (93%) LTC facilities and three (7%) hospitals (Figure 7). The number of outbreaks are consistent with average weekly submissions from the past five years at this time of the year. Influenza A(H3) was detected in 12 (29%) outbreaks, entero/rhinovirus in nine (21%) outbreaks, influenza B in 8 (19%) outbreaks, while two outbreaks had influenza A (not subtyped) and another had parainfluenza detected. Two outbreaks had mixed etiologies (influenza B/influenza A(H3) and influenza B/RSV).

Figure 7. Influenza-like illness outbreaks investigated in 2017 to date, Virology Program, BCCDC PHL. Note that some outbreaks are not reflected here if they are awaiting subtyping.



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The Public Health Laboratory at the BC Centre for Disease Control (BCCDC) provides consultative, interpretative testing and analyses for clinical and environmental infectious diseases in partnership with other microbiology laboratories and public health workers across the province and nationally. The BCCDC PHL is the provincial communicable disease detection, fingerprinting and molecular epidemiology centre providing advanced and specialized services along with international defined laboratory core functions. The Provincial Toxicology Centre conducts toxicology testing and analysis for clinical patients, including therapeutic drug monitoring, drug screening tests and forensic toxicology analyses for the BC Coroners Service.

This report may be freely distributed to your colleagues. If you would like more specific information or would like to include any figures for other reporting purposes, please contact us.

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