

LABORATORY TRENDS



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A Report from the BCCDC Public Health Laboratory



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Changes in the Provincial Toxicology Centre laboratory test menu

The laboratory of the Provincial Toxicology Centre (PTC) is undertaking instrument upgrades and process improvements, including adopting new testing methodologies and procedures, and reviewing its clinical toxicology test menu. These changes will allow the laboratory to streamline testing processes and improve analytical performance and turnaround time with the ultimate objective of ensuring reliable and high-quality testing.

As of February 8, 2019, all *quantitative* tests reported by the PTC laboratory are now performed using Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS) technology, an upgrade from the previously employed Liquid Chromatography Single Quadrupole Mass Spectrometry (LC-MS). The upgrade has improved the assays' precision, accuracy and specificity. The results obtained using the new technology will use the same Therapeutic Ranges as the previous analytical methods.

The laboratory will continue performing *qualitative* drug screens in serum, plasma and urinary samples using the older LC-MS technologies until these methods are replaced with the new advanced technologies featuring high throughput broad screening for drugs to address the issue of problematic drug use. The expected date of implementation is May–June of 2019.

While the upgrades are ongoing, obsolete and very low volume tests are being phased out while new protocols for pre-existing analytes and new drug testing technologies are being validated and implemented. As a result of these changes, the laboratory has implemented an updated menu of clinical toxicology tests. Tests that are not on this list but that have clear clinical utility and can tolerate longer turnaround times are now sent out of province to other reference laboratories. We expect that the number of tests that will have to be sent out will not exceed 100 samples per year. Our eventual objective is to repatriate the majority of these tests at a later date as the new technology platforms are fully implemented.

The up-to-date test menu and the Provincial Toxicology Centre requisition form can be found at:

<http://www.elabhandbook.info/PHSA/Default.aspx>

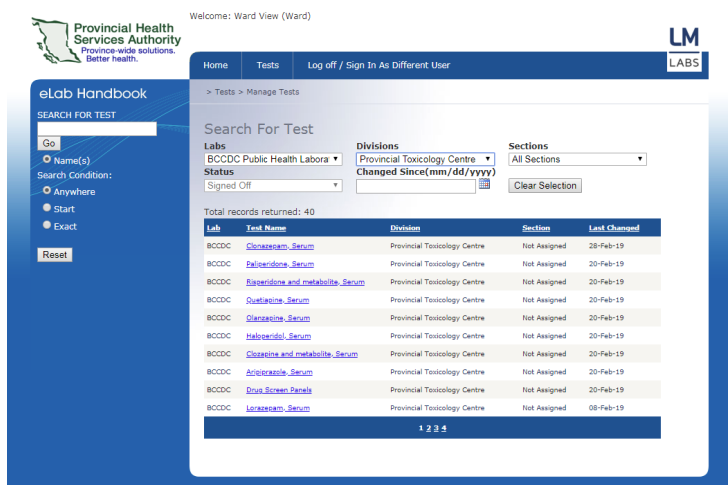
Figure 1. The staff of the Provincial Toxicology Centre receiving training to operate a new LC-MS/MS analyzer.



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To find a specific test, enter the test name into the search box on the upper left-hand side of the screen and select BCCDC Public Health Laboratory as the “home lab”.

Figure 2. A sample of the Provincial Toxicology Centre test menu available on the eLab handbook website.



To browse the test menu, click on the tab “Tests” at the top of the screen and then in the “Divisions” pull-down menu select “Provincial Toxicology Centre”.

This directory will be updated as new tests are added to our test menu.

For clinical toxicology tests not in the directory, please refer to your health authority’s test send-out procedures.

Please contact the PTC laboratory at 604-707-2714 if you have any questions.

Temporary new team lead for Virology Program

Since January 2, 2019 Frankie Tsang has assumed the role of Temporary Team Lead for the Virology Program.

Frankie Tsang started his career as a Medical Technologist at St Paul’s Hospital’s Microbiology & Virology Laboratory in 2008. In 2013, he became the supervisor (MT3) in the Technical Support Program at the BC Centre for Disease Control Public Health Laboratory (BCCDC PHL) where he improved workflows, implemented a new quality control system and revamped all their SOPs. In addition to the day-to-day operations in Technical Support, he also played a significant role in improving the PHL as he created the QC stats tool that is now used by all labs performing molecular testing, acting as the liaison between PHL and BCCSS Shipping & Receiving and being an active member of multiple quality/leadership teams (Continuous Quality Improvement, Quality Project Team and others).

In 2015 Frankie Tsang joined the Environmental Microbiology Laboratory as the Foodborne Disease GI Outbreak Technical Coordinator, and shortly afterwards in 2016 became the Team Lead of Environmental Microbiology Laboratory. During his time in Environmental Microbiology he successfully guided the section through multiple accreditations, implemented many quality improvements and began the molecularization of food testing, all the while working towards ISO accreditation for the Food Poisoning Laboratory. Frankie Tsang will continue his role as Team Lead for Environmental Microbiology until a replacement has been found.

Through the years Frankie Tsang has proven to be a leader who is passionate about creating a strong team environment and to continuously improve the quality of public health. We look forward to his temporary tenure in the Virology Program.

Improving laboratory-related patient safety outcomes and resource utilization: Joint BCCDC PHL and LifeLabs project

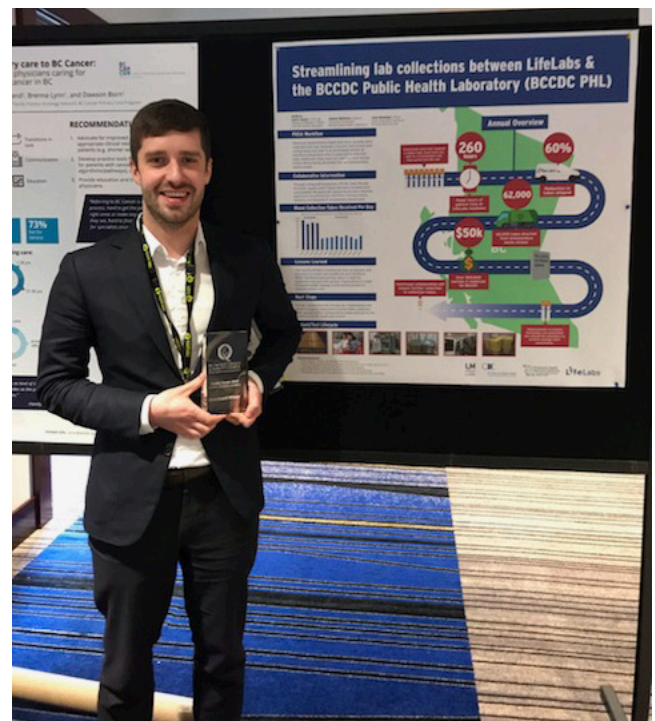
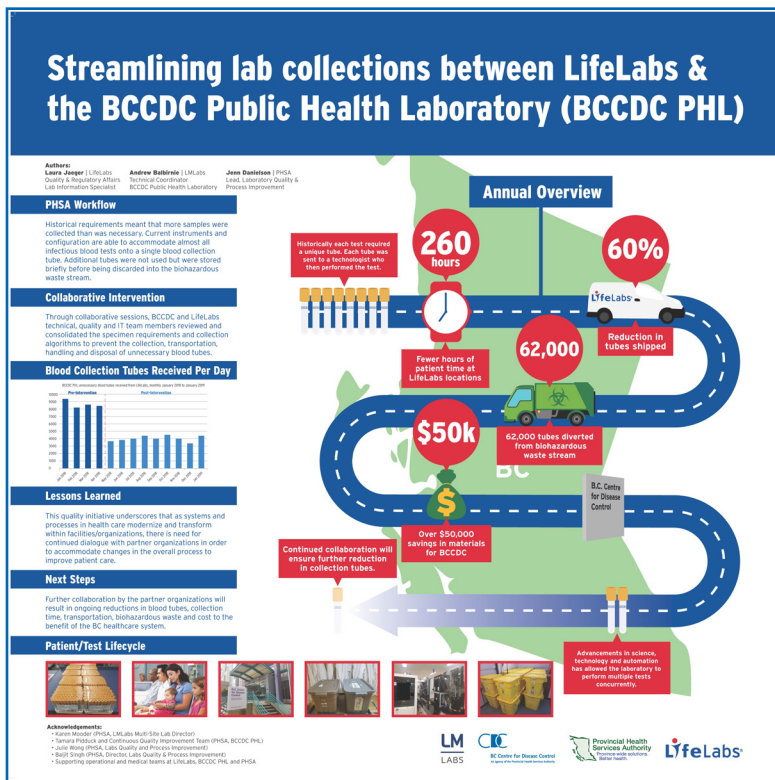
Historically due to specific testing algorithms and platforms, a unique blood tube was required for each test or set of tests. In May 2017, a project was undertaken to continue to consolidate serological testing collected at LifeLabs but performed at the BCCDC PHL onto as few separate blood collections as possible. The vast majority of serological testing done at the BC Centre for Disease Control Public Health Laboratory (BCCDC PHL) is able to be performed off of a single blood collection tube. However, until this consolidation was applied upstream at collection sites, this meant that BCCDC PHL was now handling extra tubes that would be stored before being discarded into the biohazardous waste stream.

As one of the public health laboratory's largest clients, submitting clinical laboratory specimens from patients, it was essential to work with LifeLabs to reduce their blood draws to reduce unnecessary collections. It took over a year of work between Andrew Balbirnie (Technical Coordinator, BCCDC Public Health Labs), Jennifer Danielson (Quality Lead, Labs Quality and Process Improvement, LM Labs) and Laura Jaeger (Quality & Regulatory Affairs, LifeLabs) and considerable other respective technical, quality and IT teams to finalize the consolidation, with special acknowledgement to Tamara Pidduck, Julie Wong and support from laboratory operations. This resulted in less time for patients at collection centres, less blood drawn for the patient, fewer tubes ordered, used, transported, handled and discarded and has reduced the risk of patient/laboratory safety incidents. The work and its outcomes were so significant an accomplishment that it was shared at the recent 2019 Quality Forum where its [storyboard](#) was a winner in the Clinical Practice category (Figures 3-4).

Work continues as the BCCDC PHL collaborates with other regional health authority laboratory sites and clients to reduce unnecessary blood collections in the province.

Figure 3. Joint BCCDC PHL and Lifelabs storyboard shared at the 2019 Quality Forum.

Figure 4. Andrew Balbirnie and the winning storyboard.



Implementation of the DiaSorin Liaison XL® for EBV, HSV, measles, mumps, parvovirus and VZV serology

The BCCDC PHL recently implemented a new platform for Epstein-Barr virus (EBV), Herpes simplex virus (HSV), measles (Rubeola virus), mumps (Mumps Paramyxovirus), Parvovirus and Varicella-zoster virus (VZV) serology. The DiaSorin LIAISON® XL was evaluated against and performed well compared to the Siemens BEP® 2000, the platform that was previously used for these infectious diseases markers. The DiaSorin LIAISON® XL Analyzer is a fully automated system that has several key advantages, including enabling continuous loading of samples, reagents and consumables, allowing testing in either random access or batch mode. The gains in efficiency directly impact how quickly results can be made available. This quick turnaround time has been invaluable during the current outbreaks of measles where there has been an upsurge in testing volumes as well as requests for expedited testing.

For those clients who observe the signal/index values in our reports, please note these have changed with the move to this new platform. The assays on the Liaison platform are reported qualitatively (Table 1). There have been no changes to submission requirements.

Table 1. Reporting features between the Siemens BEP® 2000 and the DiaSorin LIAISON® XL.

Infectious Disease markers	Siemens BEP® 2000	DiaSorin LIAISON® XL
Epstein Barr Virus VCA (Viral Capsid) IgG	Qualitative result	Qualitative result
Epstein Barr Virus IgM	Qualitative result	Qualitative result
HSV 1	HSV non specific-qualitative result	HSV 1 specific qualitative result
HSV 2	HSV non specific-qualitative result	HSV 2 specific qualitative result
Measles IgG	Quantitative values in mIU/mL	Qualitative result
Measles IgM	Qualitative result	Qualitative result
Mumps IgG	Quantitative values in Titre	Qualitative result
Mumps IgM	Qualitative result	Qualitative result
Parvovirus B19 IgG	Qualitative result	Qualitative result
Parvovirus B19 IgM	Qualitative result	Qualitative result
Varicella (VZV) IgG	Quantitative values in mIU/mL	Qualitative result

Invasive Group A *Streptococcus*

From 2009-2018 there have been 2255 isolates submitted for *Streptococcus pyogenes* (Group A *Streptococcus*) serotyping. Submissions in 2018 were consistent with the volumes from 2017 (Figure 5).

S. pyogenes emm typing by the M protein virulence factor is performed by the the National Microbiology Laboratory. In 2018 type *emm76* together with *emm* type 1 were the most frequently seen, accounting for a total of 34% of all serotypes isolated. This is a shift from previous years where *emm* type 1 has been the dominant serotype over most years since 2009. The next most frequently detected serotype in 2018 was type *emm81* (13%), a serotype that has only been seen at low levels until 2017 when it represented 7% of all isolates submitted (Figure 6).

In 2018, type *emm1* isolates were from patients covering nearly the entire spectrum of age groups compared to those with type *emm76* and *emm81* that were isolated most frequently in adults 30 years and older (Figure 7).

Figure 5. Total isolates submitted for serotyping, collected 2009-2018, Advanced Bacteriology & Mycology Program, BCCDC PHL.

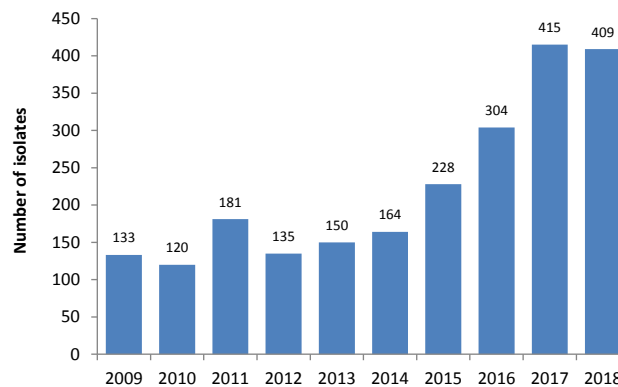


Figure 6. Percentage of top *emm* types, collected 2009-2018. Advanced Bacteriology & Mycology Program, BCCDC PHL.

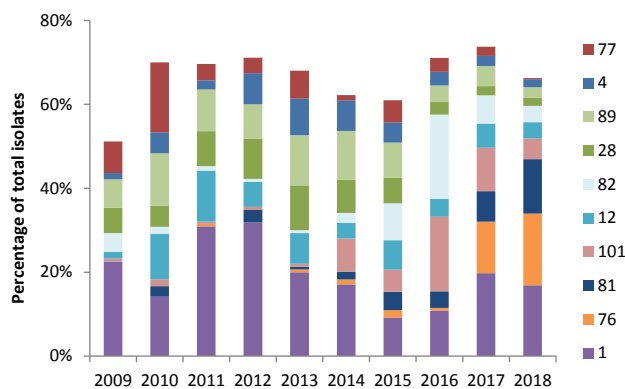
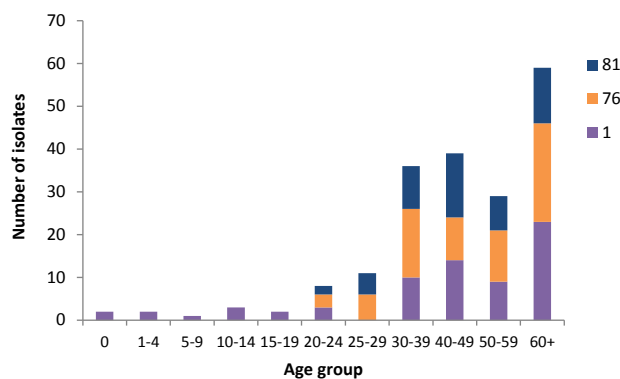


Figure 7. Age groups of patients with isolates with *emm* types 76 and 1, collected in 2018, Advanced Bacteriology & Mycology Program, BCCDC PHL.



Measles outbreaks

Since January 2019 there have been 20 confirmed cases of measles in the province. Earlier this year, two of these cases acquired measles while travelling to the Philippines where an outbreak has been observed since 2018. Travel to Vietnam also resulted in importation of measles first through a family cluster of three unvaccinated, school-aged children which then subsequently spread to their peers, other family members at three schools in Vancouver as well as to a healthcare worker and an unrelated child exposed at a hospital where one of the cases presented. To date there have been 12 laboratory-confirmed cases along with one known epidemiologically-linked cases related to the school outbreak. In February, two additional cases of measles, one with an unknown source and the other again due to travel in the Philippines were additionally reported. In March, another measles case reported travel to the US where the individual had been exposed to a case in that area; since then another family member has been confirmed with measles. The latest case in March (unrelated to the school outbreak) also reported travel to Vietnam (Figure 8).

The National Microbiology Laboratory (NML) performs national genotype surveillance for measles virus. Genotyping can provide information on links between cases, identifying possible sources of importation and other transmission patterns on circulating strains. They have reported that those who reported travel to the Philippines had genotype B3 while those related to the school outbreak so far have all been genotype D8, with a strain that has been circulating globally, including in Vietnam.

These outbreaks have caused laboratory testing requests to surge, particularly in February and March (Figure 9). Cases of measles-like illness have also been detected in individuals with recent vaccination as a positive IgM and detectable measles RNA can be induced. Clients are reminded that patients who experience fever and mild rash 7-12 days following their first dose of MMR vaccine and who have not been exposed to a known measles case need not be tested. Acute measles is confirmed by detection of anti-measles IgM and/or detection of viral RNA from a nasopharyngeal (NP) (preferred) or a throat swab and urine. Samples should include clotted blood in a SST (gold top) tube for serology

Figure 8. Wild-type measles cases in 2019, High-volume serology and Virology Programs, BCCDC PHL.

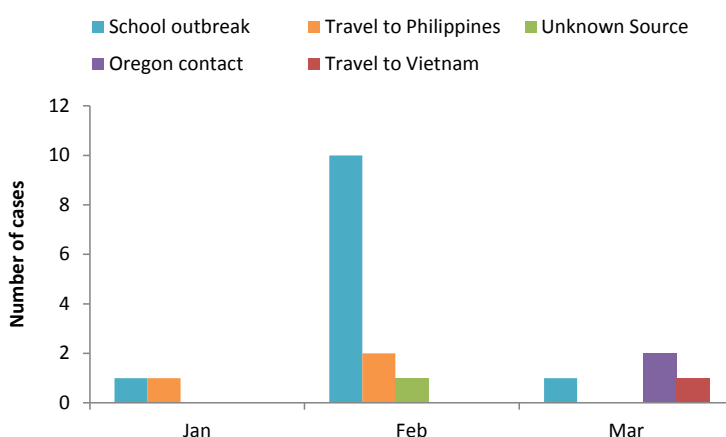
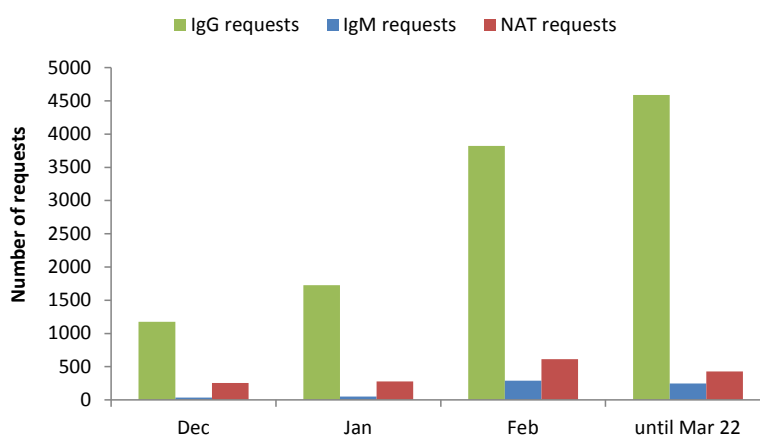


Figure 9. Requests for measles serology and NAT testing from November 2018 to March 2019, High-volume serology and Virology Programs, BCCDC PHL.



and nasopharyngeal or throat swabs submitted in universal transport media for nucleic acid testing (NAT). Urine may also be submitted in a sterile urine container for NAT.

Further information on measles testing may be found on the eLab handbook: <http://www.elabhandbook.info/PHSA/Default.aspx>.

Gastrointestinal outbreaks

From January to March there were 136 gastrointestinal (GI) outbreaks investigated by the BCCDC PHL (Figure 10). The number of notifications have exceeded what was experienced in previous years for several weeks at the beginning of February and in March. Outbreaks were investigated from 90 (66%) longterm care (LTC) facilities, 27 (20%) daycares/schools, 17 (12%) hospitals, one restaurant (1%) and one other facility type (1%). Samples were received from 68% of these outbreaks with norovirus detected in 73 (78%) (from 53 LTC facilities, 14 hospitals/acute care facilities, five daycares/schools and from one restaurant). Sapovirus was detected in samples from a daycare/preschool and *Aeromonas* was also detected from a LTC facility outbreak.

As part of ongoing norovirus surveillance for the province, the Environmental Microbiology Program of BCCDC PHL genotypes confirmed norovirus outbreaks to monitor the molecular epidemiology of norovirus transmission across BC. Based on sequencing the capsid gene (region C), GII.4 Sydney remains the dominant strain in the province, comprising 50% of isolates genotyped in 2018 and so far 67% of isolates genotyped in 2019 (Figure 11).

The algorithm for non-daycare GI outbreak testing includes screening for norovirus NAT first and then reflexing to the GI panel if norovirus is not detected. The GI panel can detect sapovirus, adenovirus, rotavirus and astrovirus. For daycare outbreaks, norovirus NAT and the GI panel are run concurrently. When no viruses are detected, stool samples are forwarded to the Public Health Advanced Bacteriology & Mycology and Parasitology Programs for further assessment.

Figure 10. Gastrointestinal outbreaks investigated in 2019, 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.

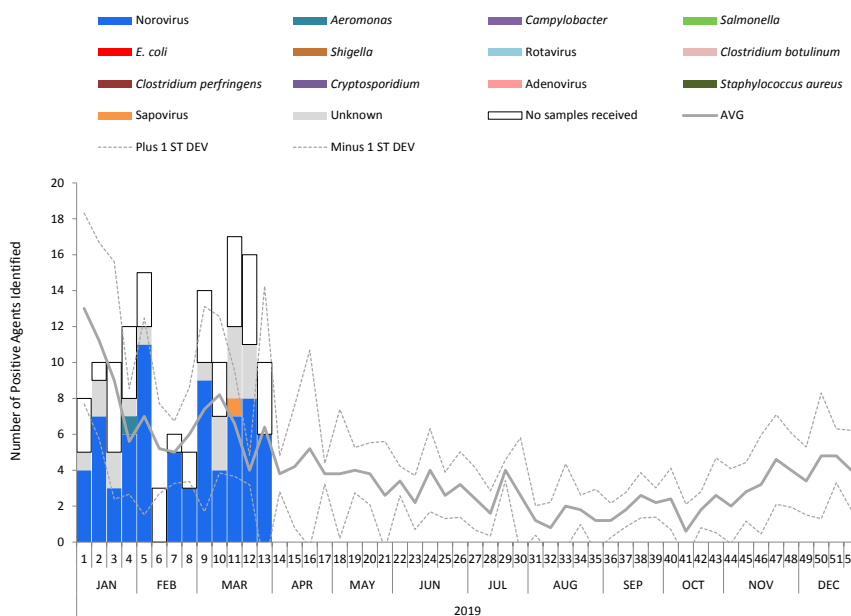
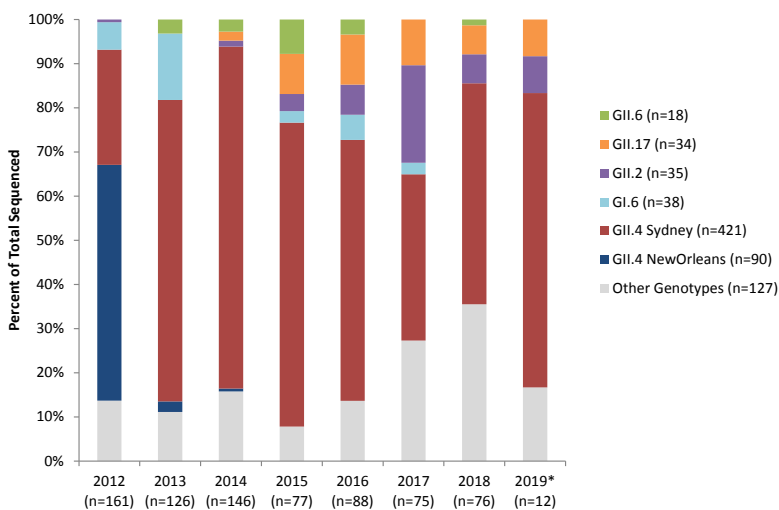


Figure 11. Region C genotyping of norovirus outbreak samples, Environmental Microbiology Program, BCCDC PHL. (Note: not all norovirus-positive outbreaks are reflected here due to sequencing limitations.)

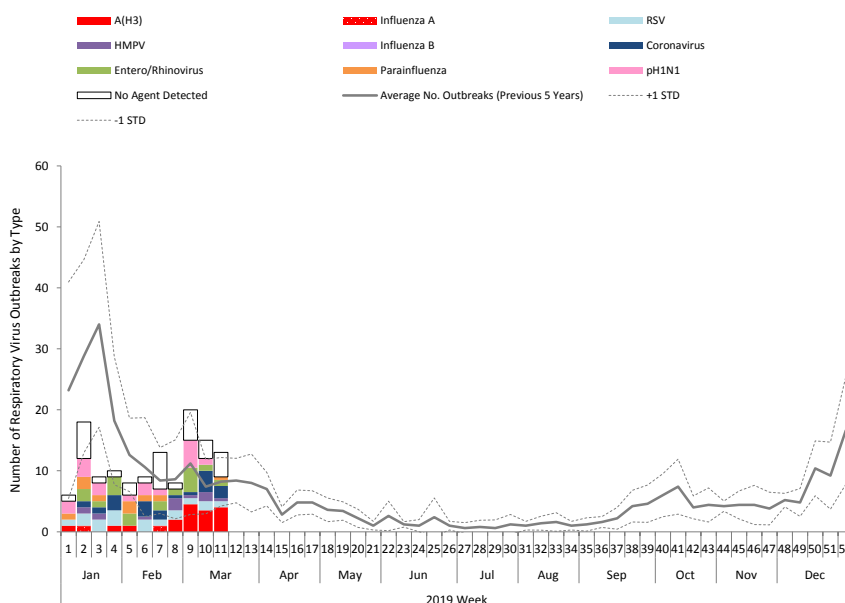


Respiratory outbreaks

From January to the first half of March there were 129 influenza-like illness (ILI) outbreaks investigated by the Virology Program of BCCDC PHL. Specimens from these outbreaks were submitted from 122 (95%) LTC facilities, five (4%) hospitals and two other facility types (2%). The number of outbreaks was at the lower end of average weekly submissions from the past five years during the first few weeks of the year until March when the number of outbreaks investigated was at the higher of previous seasons (Figure 12).

The majority of the outbreaks have been due to influenza A (36; 28%) with a split between A(H1N1)pdm09 and A(H3) subtypes. Other viruses detected included enterovirus (17; 13%), respiratory syncytial virus (16; 12%), coronavirus (15; 12%), parainfluenza (9; 7%) and human metapneumovirus (7; 5%). At this time last season there were more outbreaks due to influenza (27% influenza B and 15% influenza A) as well as fewer detections of enterovirus and parainfluenza.

Figure 12. Influenza-like illness outbreaks investigated in 2019 to date, Virology Program, BCCDC PHL. Note that some outbreaks are not reflected here if they are awaiting subtyping.



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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