

LABORATORY TRENDS



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A Report from the BCCDC Public Health Laboratory



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New staff appointments



We are pleased to announce the appointment of Dr. Linda Hoang as the new medical director for the BCCDC Public Health Laboratory (PHL). Dr. Hoang has been with the PHL since 2006, serving as the program head of the Bacteriology and Mycology Laboratory. In this time, Dr. Hoang has made significant contributions to public health in B.C., strengthening public health microbiology, determining how to respond to emerging pathogens, building and implementing new laboratory programs, and ensuring capacity to employ technological advances in the laboratory. She continues her role as co-program head of the Molecular Microbiology and Genomics programs, guiding the advancement of new technologies such as genomics at the PHL while also supporting assay development and refinement. As medical co-director for the Provincial Infection Control Network she has contributed significantly to reducing healthcare-associated infections in the province. One example is spearheading the provincial establishment of a carbapenemase-producing organism surveillance system to monitor trends of these antibiotic-resistant bacteria. Nationally, she contributes to the Canadian Public Health Laboratory Network, supporting the partnerships between PHL, the National Microbiology Laboratory and other public health laboratory partners across Canada. Dr. Hoang also has an academic appointment as a clinical professor for the University of British Columbia's Department of Pathology and Laboratory Medicine where she continues to mentor students for the BC Medical Microbiology Residency Training Program and through her research grants. Dr. Hoang served as interim medical co-director with Dr. Inna Sekirov for the past year, who we would also like to acknowledge for supporting the PHL on top of her existing duties as program head for the Tuberculosis/Mycobacteriology Laboratory.

We would also like to welcome Dr. Jennifer Grant as the new program head of the Bacteriology and Mycology Laboratory. Dr. Grant joins us from the Vancouver General Hospital (VGH) Microbiology Laboratory where she practiced a full spectrum of medical microbiology and clinical infectious diseases, with a focus on bacteriology and antimicrobial stewardship. At VGH Dr. Grant helped found the antimicrobial stewardship program (ASPIRES) and became the regional medical director. Dr. Grant has also worked closely with the Ministry of Health in her role as co-chair of the provincial committee on COVID-19 therapy (CTC) that led the treatment strategies for COVID-19.



We would finally like to congratulate Dr. Adriana Airo as the new program head for the High Volume Serology Laboratory. She is a Fellow of the Canadian College of Microbiologists who completed her post-graduate training at the University of Toronto. Prior to that, Dr. Airo completed her doctoral studies in virology in the Department of Medical Microbiology & Immunology at the University of Alberta and her Bachelor of Science in Microbiology and Immunology from the University of British Columbia. As program head, she first off will be leading the extensive project to replace the existing analyzers and automation equipment of the High Volume Serology Laboratory. The laboratory performs approximately two million infectious disease serology tests per year (nearly 8000 tests per day) to support patient and population diagnosis, reportable and emerging disease surveillance, and outbreak tracing.



Island Health Cerner and BCCDC PHL Sunquest interface: HIV, HTLV, and prenatal testing

As of October 4, 2023, HIV testing (HIV NAT and HIV serology/screening), HTLV serology, and the prenatal infectious diseases panel tests are now utilizing the bi-directional laboratory interface between Island Health's Cerner Laboratory Information System (LIS) and VPP/CDC Sunquest LIS. Orders from Island Health laboratories are placed in Cerner and received in Sunquest, and results for these are sent directly back into Island Health's clinical/laboratory systems to be available for laboratory staff, clinicians and patient portals (MyHealth portal).

In addition to near real-time results availability, this interface also speeds up pre-analytical accessioning by 50%, leading to fewer typographical errors, missing tests/specimens, and mis-sent reports for these high-volume tests. The interface with Island Health was built during the COVID-19 pandemic in December 2020 to enable provincial coordination of COVID-19 NAT lab testing. These new interfaced orders now join syphilis testing as another target for interfacing which was implemented in February 2022. Other laboratory interfaces exist for tests from Yukon's Meditech LIS, Fraser Health's Meditech/Meditech Expanse LIS, LifeLabs intRlab LIS (orders only), and pandemic COVID testing interfaces from Interior Health Meditech LIS and Northern Health Cerner LIS.



Syphilis

Rates of syphilis have been increasing in Canada over the past decade from 5.1 cases per 100,000 in 2011 to 24.7 cases per 100,000 in 2020 (Aho et al 2022). Previously, infections have largely been seen in the male population; however, from 2016 to 2020 the rate of increase has been more pronounced in females, increasing 773% from 1.7 cases per 100,000 in 2016 to 14.9 cases per 100,000 in 2020 (Aho et al 2022). A corresponding increase in congenital syphilis cases has also been observed in Canada, from seven reported cases in 2017 compared to 96 cases in 2021 (PHAC, 2022). Similarly in BC, rates have also been steadily increasing from 4.2 cases per 100,000 in 2011 to an annual incidence of about 37 per 100,000 population in 2022 and 2023 (projected) (BCCDC CPS 2023). Recent years have seen dramatic increases in the rates of female cases (Figure 1) as well as congenital cases (Figure 2).

Laboratory diagnosis of syphilis starts with screening using a chemiluminescence-based immunoassay by the BCCDC PHL High Volume Serology Laboratory followed by confirmatory *Treponema pallidum* Particle Agglutination (TPPA) testing and non-treponemal Rapid Plasma Reagin (RPR) testing at BCCDC PHL Zoonotic and Emerging Pathogens (ZEP) Laboratory. Except during the early pandemic years (2020-2021), the number of patient tests has increased overall yearly 3-8% with the number of non-prenatal tests skewing towards tests from females starting in 2020 (from 46-48% prior to 2020 to about 53-54% from 2020) (Figure 3).

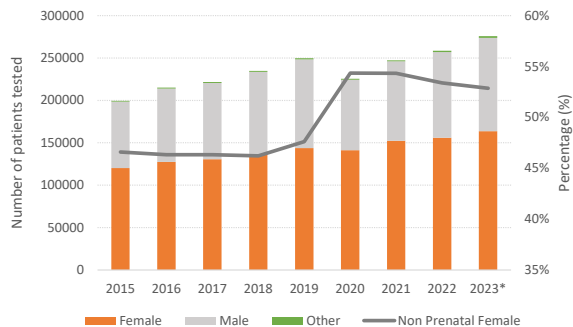


Figure 3. Syphilis serology screening by patient gender, BCCDC PHL High Volume Serology. *Volumes until end of November.

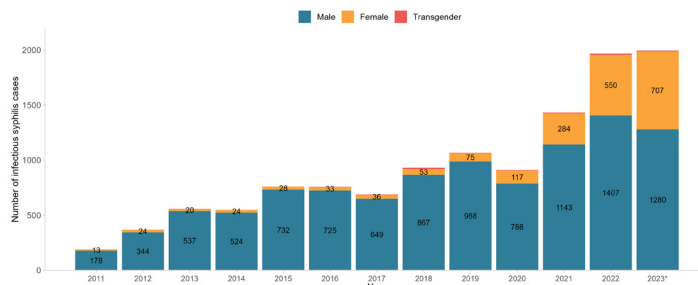


Figure 1. Infectious syphilis cases by gender in BC, 2011-2023. *Projected case counts based on reported cases up to and including 2023Q3. Note: Counts shown for male and female infectious syphilis cases. Collection on transgender as a gender value began in 2018 in the new EMR system.

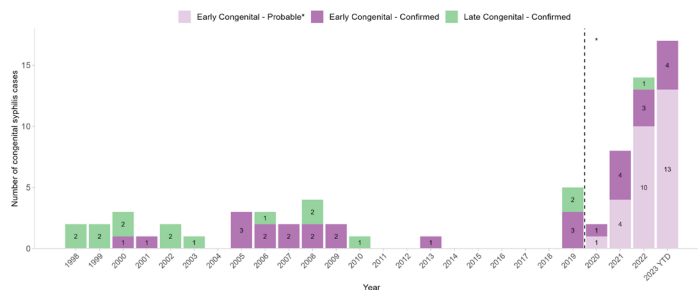


Figure 2. Congenital syphilis cases in BC, 1998-Sept 2023 to date. *BC developed a new case definition for probable congenital syphilis in March 2023. A retrospective review to 2020 was completed to identify cases that met the new probable congenital syphilis case definition. As a result, there are no probable congenital syphilis cases reported prior to 2020; trends should be interpreted with caution. Source: BCCDC Clinical Prevention Services Epi & Surveillance Team

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Aho J, Lybeck C, Tetteh A, Issa C, Kouyoumdjian F, Wong J, et al. Rising syphilis rates in Canada, 2011-2020. *Can Comm Dis Rep.* 2022;48(2/3):52-60. Retrieved from: <https://www.canada.ca/content/dam/phac-aspc/documents/services/reportspublications/canada-communicable-disease-report-ccdr/monthly-issue/2022-48/issue-2-3-february-march-2022/ccdrv48i23a01-eng.pdf>

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BCCDC Clinical Prevention Services. Quarterly Surveillance Report 2023 Q3. Retrieved from: http://www.bccdc.ca/resource-gallery/Documents/Statistics%20and%20Research/Statistics%20and%20Reports/STI/CPS_Quarterly_Surveillance_Report_Q3_2023.pdf



Carbapenemase-producing organisms

The latest counts for cases of carbapenem-resistant bacteria in BC can be found in [Figure 4](#). The BCCDC PHL Public Health Advanced Bacteriology/ Mycology Program provides molecular and genotypic testing of suspect isolates submitted from other microbiology laboratories and health care facilities in the province for carbapenemase genes. As was observed for other pathogens, a decrease in carbapenem-producing organism (CPO) cases was observed during the COVID-19 pandemic period of 2020-2021, followed by a return to pre-pandemic levels in 2022 and now a sharp increase so far in 2023.

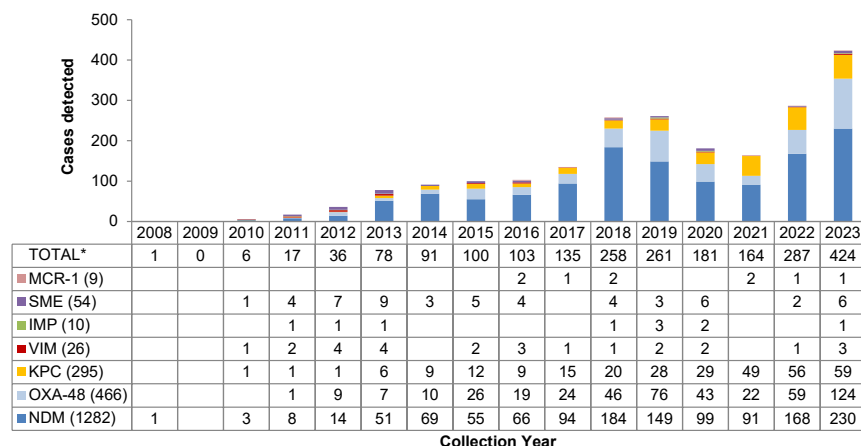
To date, there have been the following number of patients with CPOs: 1282 harboured the New Delhi Metallo-β-lactamase (NDM) gene, 466 cases with OXA-48 carbapenemase and 295 cases with the *Klebsiella pneumoniae* carbapenem (KPC) β-lactamase gene. Fifty-four cases with the *Serratia marcescens* enzyme (SME) resistance gene have also been identified as well as nine cases of *mcr-1* (mobilized colistin resistance) to date. Some patients had multiple resistance factors.

The Provincial Infection Control Network of BC (PICNet) monitors trends in CPOs as part of the provincial surveillance program using laboratory data in addition to surveillance and case data provided by health authorities and community practitioners. Surveillance for this program initially concentrated on testing for patients at acute care facilities

who had recently traveled or received care in countries where CPOs are more common but was expanded to screening patients who are residents of retirement communities where CPO spread is suspected.

The Public Health Advanced Bacteriology/Mycology Program also routinely sequences CPO-positive isolates to look at relatedness between strains. This is currently performed on the Illumina NextSeq platform but is also supplemented by long-read Oxford Nanopore MinION technology, particularly for cluster investigations. Cluster analysis using whole genome sequencing can resolve whether transmission is occurring clonally where the same organism and plasmid are transmitted, or is plasmid-mediated where only plasmid genes are transmitted. This type of analysis can also be done to investigate possible transmission events between patient cases and environmental sources.

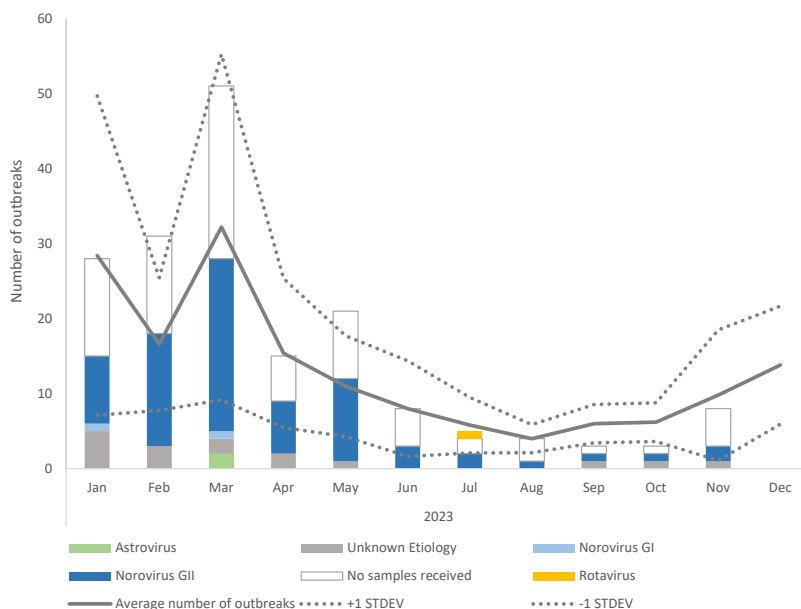
Figure 4. Carbapenem-resistant cases from 2008 to November 30, 2023, Public Health Advanced Bacteriology & Mycology Program, BCPHML. *Counts are inclusive of cases with multiple gene resistance targets.



Gastrointestinal outbreaks

From January to November there were 178 gastrointestinal (GI) outbreaks investigated by the BCCDC PHL (Figure 5). After several months investigating numerous GI outbreaks earlier this year, the number of outbreaks decreased over the summer and into the fall before starting to increase again in November. Outbreaks were investigated from 80 (45%) daycares/schools, 79 (44%) longterm care facilities (LTCF), 10 (6%) hospitals, six restaurants (3%) and three other facility/event types (2%). Samples were received from 54% of these outbreaks with norovirus detected in 78 (80%) (from 57 LTC facilities, eight hospitals/acute care facilities, seven daycares/schools, and six restaurants). Astrovirus was also detected from two daycares/schools in March while rotavirus was detected in a daycare/school in July.

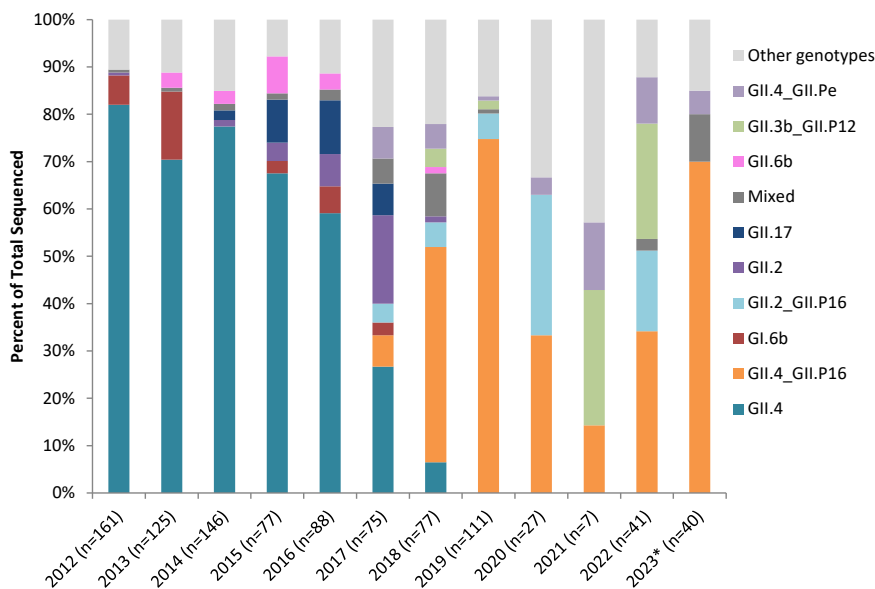
Figure 5. Gastrointestinal outbreaks investigated in 2023 (Jan-Nov), Environmental Microbiology, Public Health Advanced Bacteriology & Mycology, Parasitology and Virology Programs, BCCDC PHL. Average number of outbreaks are based on the previous 5 years. The data available are from outbreaks in which 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.



Norovirus sequencing

The Environmental Microbiology Program of BCCDC PHL provides norovirus genotyping by sequencing the norovirus polymerase gene (region B) and Capside gene (region C). In 2023 so far, the dominate genotype continues to be GII.4_GII.P16, accounting for 70% of all sequenced samples. Samples with mixed and an array of other genotypes at low frequencies have also been detected (Figure 6).

Figure 6. Norovirus genotypes sequenced by Environmental Microbiology, BCCDC PHL, 2012-2023 (*to date).



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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