



# LABORATORY TRENDS



May 23, 2014

## Laboratory News

### Provincial Health Officer's Award

At the recent Health Officer's Council meeting in Victoria, Dr. Mel Krajden was awarded the Provincial Health Officer's Award for his work in hepatitis in BC. Dr. Krajden is the Medical Director of Hepatitis Services and Associate Medical Director of the BCPHMRL where he is Program Head/Medical Microbiologist for the Virology and High-Volume Serology Programs. He is also a Professor of Pathology and Laboratory Medicine at the University of British Columbia (UBC) and has held numerous grants related to hepatitis prevention and care services.

### Pathology Day Service Award

Ms. Sultana Mithani, Supervisor in the BCPMRL Public Health Advanced Bacteriology & Mycology Program, will be a recipient of a Technical Staff Service Award from the UBC Department of Pathology & Laboratory Medicine during Pathology Day on Friday May 23, 2014. These awards celebrate and recognize the contributions of committed technicians and technologists whose outstanding performance enhances the mission of the Department to "maintain national leadership and international prominence within the discipline of pathology and laboratory medicine" and helps create a more positive environment for colleagues and trainees.

Sultana is an expert in medical mycology and has over 30 years' experience in the field. She is being recognized for her achievements in teaching in the Department as residents and students come through during their rotation at the BCPHMRL. Sultana's warm personality and dedication to educating peers and students alike are assets to the program and to the BCPHMRL. We are proud to see her acknowledged with this award as she is

an integral part of the public health laboratory system in BC.



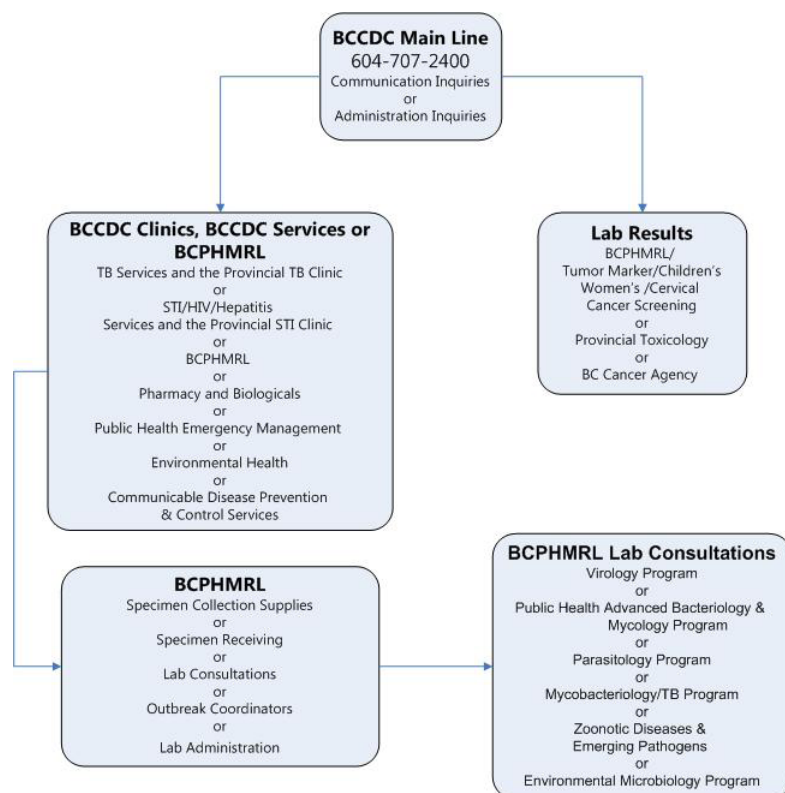
### In this Issue:

Laboratory News .....	1
Changes to Syphilis Screening .....	2
<i>N. gonorrhoeae</i> Surveillance .....	5
<i>N. meningitidis</i> Surveillance .....	7
Influenza Surveillance .....	8
Respiratory Outbreaks .....	9
Gastrointestinal Outbreaks .....	10

### Improved BCCDC Telephone Line Now Live

The BC Centre for Disease Control (BCCDC) main telephone line has recently been updated with improved and comprehensive options for contacting staff and programs within the building. This project was undertaken by members of the BCCDC Administrative Services and the BCPHMRL Continuous Quality Improvement (CQI) Committee.

The telephone tree is outlined in the figure below. When you call the main line at 604-707-2400 we hope what you find is a more user-friendly interface that allows you to contact the appropriate area in a fast and efficient manner.





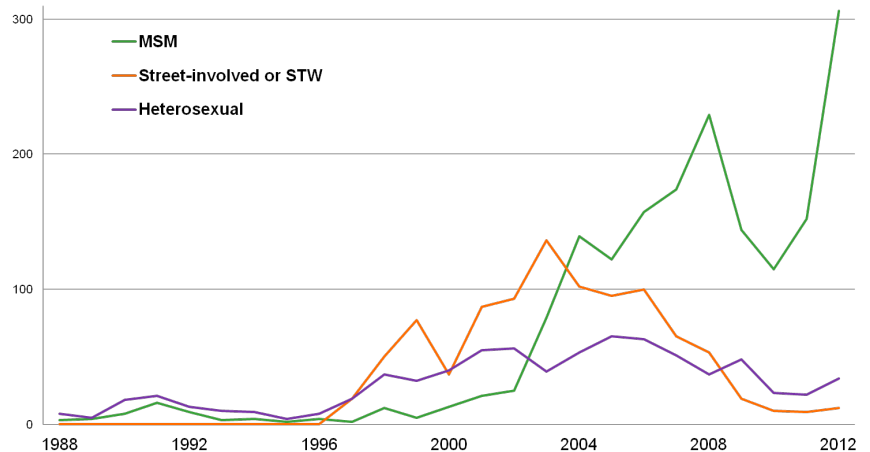
## Automated Syphilis Screening Implementation

Syphilis, caused by the bacterium *Treponema pallidum* sub spp *pallidum*, was first reported in Europe at the end of 15th century.

Infections may be sexually transmitted as well as spread from an infected mother to her fetus or through blood transfusions.

Although *T. pallidum* remains highly sensitive to penicillin, it remains a worldwide scourge. Globally, 25 million people are infected, with an estimated annual incidence of 12 million cases. Recent sharp increase in syphilis infection rates have been seen in men who have sex with men (MSM) in BC (Figure 1) as well as globally. In BC, syphilis infection rates are higher than the average Canadian rate.

Figure 1 Infectious syphilis cases by exposure category in BC, 1998 to 2012. BCCDC Clinical Prevention Services.



*T. pallidum* infection may produce disease in three stages. Entering through intact or abraded skin or mucous membranes and multiplying at the site of entry results in this spirochete causing painless ulcers (chancres) approximately 3 weeks (range 10 to 90 days) post exposure. This is the first stage of syphilis. Without treatment infections may resolve within 1 to 5 weeks.

Humoral antibodies against cardiolipin (a nonspecific antigen that was discovered to cross-react well with *T. pallidum* antigens) and treponemal antigen (from animal sources) usually do not appear until 1 to 4 weeks after the chancre. During this time the ulcer heals and *T. pallidum*, if not treated, spreads systemically. This is the second stage of syphilis.

Multiple types of rashes and flu-like symptoms mimicking many other diseases may appear about 2 to 6 weeks later. This second stage (secondary syphilis), if untreated, either resolves within 2 to 6 weeks or the infection can proceed to the third stage (latent or late stages of syphilis) as long as 30 years later. One-third of untreated patients with third stage infections end up with chronic manifestations of disease including gummas (in any tissue) and cardiovascular or neurological signs and symptoms.

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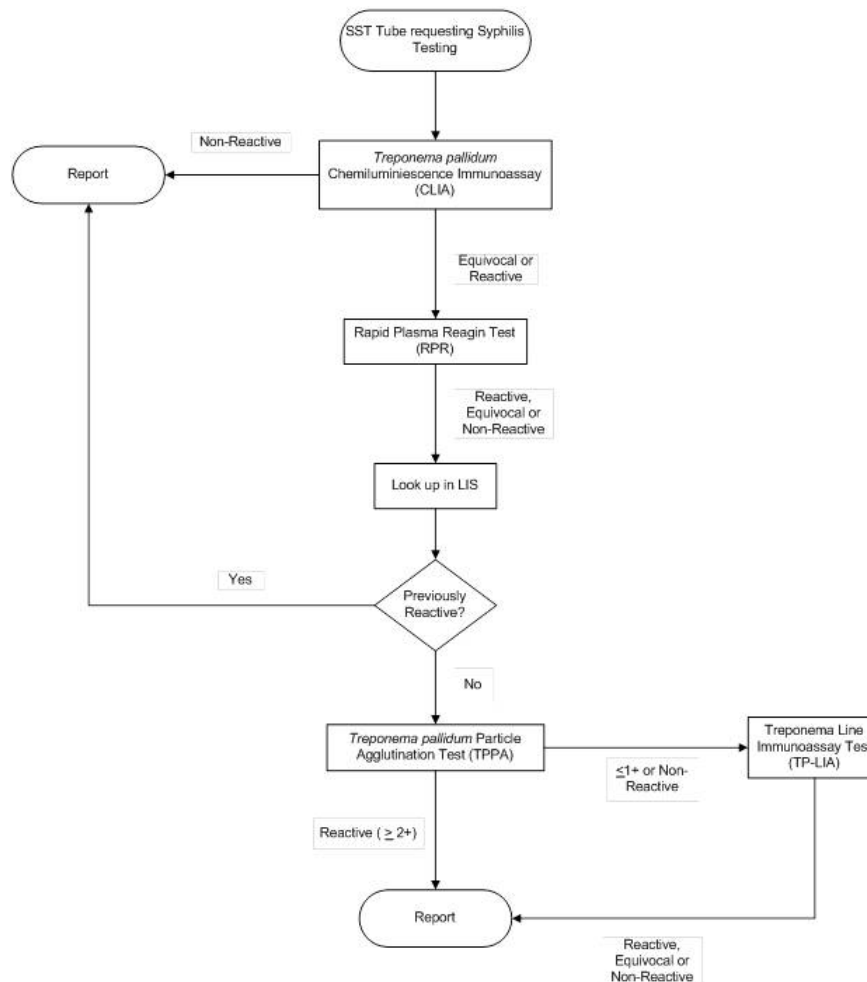
## Automated Syphilis Screening Implementation

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The laboratory diagnosis of syphilis infection is complex. Since this organism cannot be cultured, serology is the mainstay for diagnosis. Recently, due to the needs for finding efficiencies for high-volume screening, addressing ergonomic issues such as pipetting, and with the development of better tests, laboratories now have the opportunity to change their diagnostic approach.

Briefly, screening of blood samples can be moved onto a fully automated analyzer using the *T. pallidum* specific antigens chemiluminescence immunoassay (CLIA) assay. Screen reactive samples are then tested with several specialized confirmatory, quantitative, non-treponemal tests (including RPR or VDRL, etc.) (Figure 2).

Figure 2 [New BCPHMRL syphilis serology algorithm.](#)



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## Automated Syphilis Screening Implementation

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If any test results disagree, the sample is then tested using the *T. pallidum* particle agglutination assay (TPPA) as the confirmatory treponemal test. This new screening approach is sometimes referred to as a reverse algorithm in high-volume testing. This algorithm results in efficiencies, addresses ergonomic issues for technologists, and detects more cases (increased sensitivity) for early as well as latent syphilis. One challenge with this new approach, however, is that there will be more false positives due to the increased test sensitivity. To address this issue, a second treponemal test such as TPPA has been recommended.

The BCPHML recently evaluated and validated a Siemens ADVIA Centaur Syphilis chemiluminescence immunoassay. This fully automated, antigen sandwich immunoassay (ADVIA Centaur XP system platform) uses direct chemiluminometric technology. Both characterized and routine samples used in our validation studies yielded excellent sensitivity, specificity and reproducibility. Discordant samples were resolved completely using the algorithm developed (Figure 2).

Syphilis screening using chemiluminescence based immunoassay will be implemented in the near future in our automated High Volume Serology Program in Central Processing Receiving (Lane Level) Laboratory. One SST blood collection tube will be required to perform this test. Since screening tests will be done using treponemal antigens, physicians will no longer need to order confirmatory testing separately as was previously done for patients with conditions such as uveitis, neurosyphilis, congenital infections or primary syphilis. However, clinicians must be aware that there may be complicated cases and communications between the laboratory and the clinician is of utmost importance.

For any diagnostic issues related to syphilis please do not hesitate to contact Dr. Muhammad Morshed at 604-707-2622. For important information regarding treatment and follow-up of prenatal or congenital syphilis positive cases, please contact the Provincial STI Clinic Physician at 604-707-5606.



## Neisseria gonorrhoeae Susceptibility Trends

The prevalence of antimicrobial resistant *Neisseria gonorrhoeae* and emergence of increasing resistance to third generation cephalosporins is a global public health issue. The Public Health Advanced Bacteriology & Mycology (PHABM) Program continues to monitor the situation in BC by performing *N. gonorrhoeae* antimicrobial susceptibility testing by E test® on culture-positive isolates from the province to first-line cephalosporins as well as alternative antimicrobials including azithromycin, ceftriaxone, cefixime, ciprofloxacin, penicillin, spectinomycin, and tetracycline.

As an update to the May, 2012 issue, since 2010, the PHABM Program continued to see trends of overall decreasing minimum inhibitory concentrations (MICs) for cefixime, ceftriaxone and azithromycin in 2013 and into the first four months of 2014 (Figure 3). In 2013, 0.5% of isolates demonstrated decreased susceptibility to cefixime (MIC  $\geq 0.25$   $\mu\text{g/mL}$ ) and 0.7% of isolates demonstrated decreased susceptibility to ceftriaxone (MIC 0.125  $\mu\text{g/mL}$ ). Azithromycin resistance was seen in 0.7% of isolates (MIC  $\geq 2.0$   $\mu\text{g/mL}$ ).

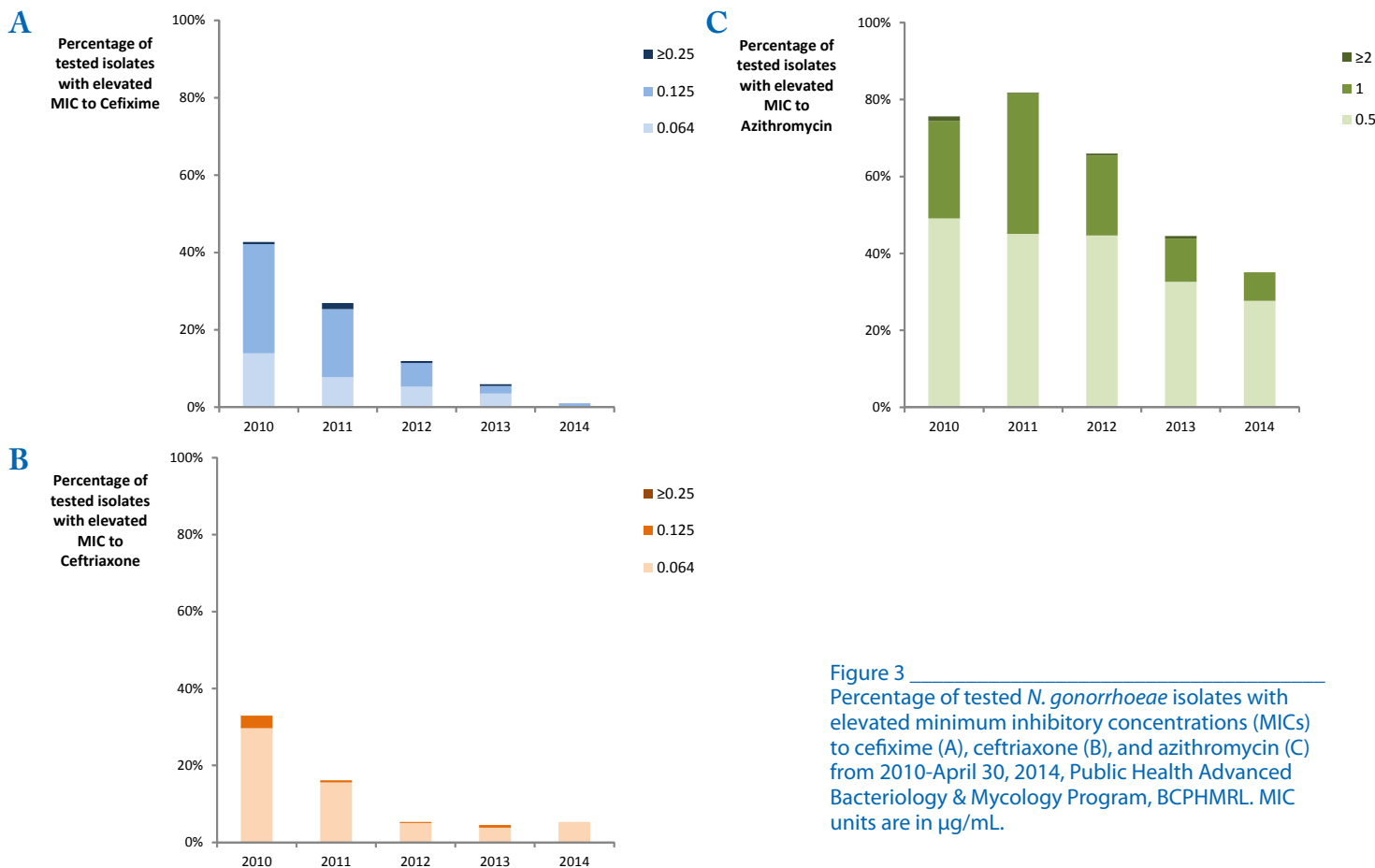


Figure 3 Percentage of tested *N. gonorrhoeae* isolates with elevated minimum inhibitory concentrations (MICs) to cefixime (A), ceftriaxone (B), and azithromycin (C) from 2010-April 30, 2014, Public Health Advanced Bacteriology & Mycology Program, BCPHMRL. MIC units are in  $\mu\text{g/mL}$ .

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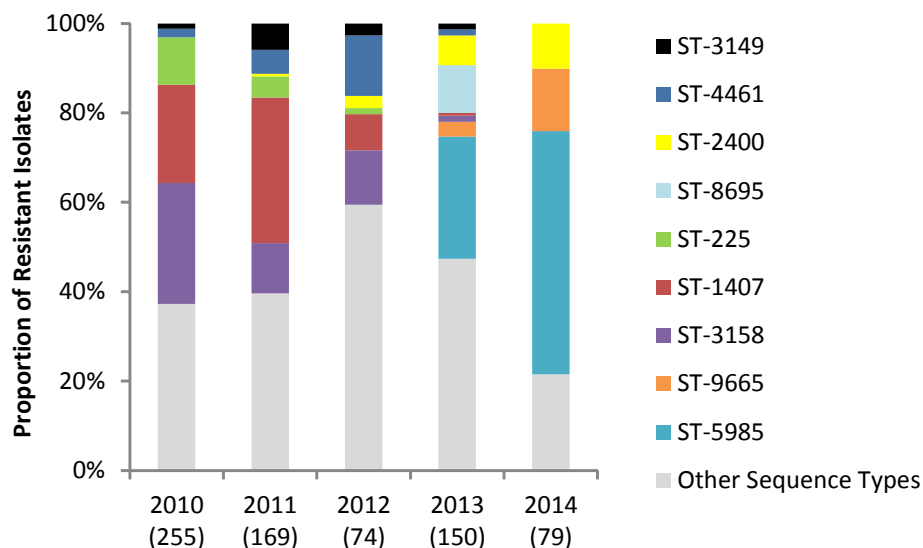


## Neisseria gonorrhoeae Susceptibility Trends

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To gain an understanding of the different strains that are prevalent in the population, resistant isolates are also forwarded to the National Microbiology Laboratory where *N. gonorrhoeae* multiantigen sequence typing is performed. In 2010, the two most common sequence types from all resistant isolates submitted to the NML were ST-3158 (27%) and ST-1407 (22%) (Figure 4). These two sequence types were seen in subsequent years (11% and 33% in 2011; 12% and 8% in 2012, respectively) until 2013 when only 1-2 isolates of these strains were seen and ST-5985 became the dominant sequence type (27% of all resistant isolates). ST-5985 is associated with tetracycline resistance and appears to be predominately occurring in BC only. So far in 2014, over 54% of all resistant isolates have been ST-5985. This change to a different, dominant sequence type is indicative of a shift in the *N. gonorrhoeae* resistance strain currently present in the province.

Figure 4  
*N. gonorrhoeae* multiantigen sequence types of resistant isolates, January 8, 2010-April 17, 2014, National Microbiology Laboratory.



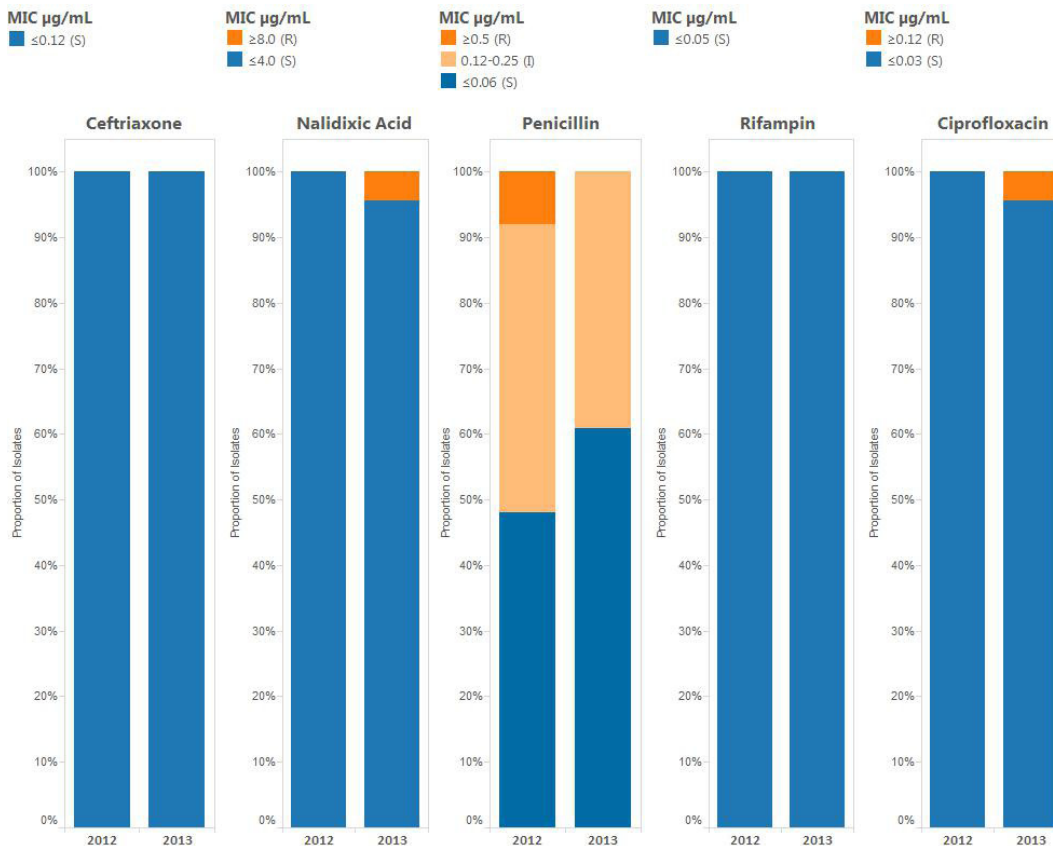
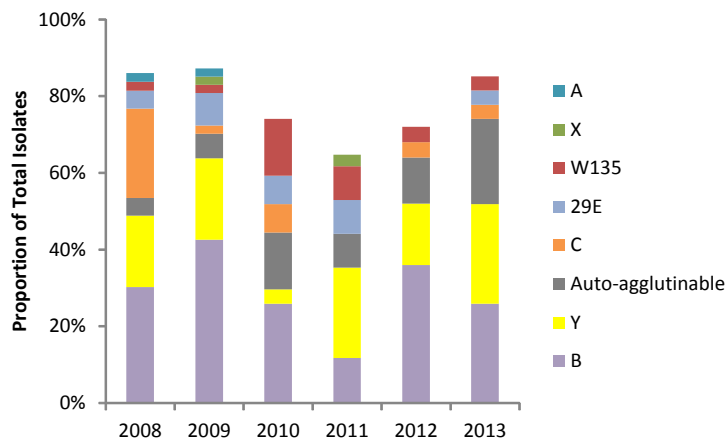


## Neisseria meningitidis Susceptibility Trends

*Neisseria meningitidis* is an aerobic Gram-negative encapsulated bacterium that normally colonizes the mucosa of the upper respiratory tract without causing invasive disease. Meningococcal disease occurs rarely in Canada resulting in meningitis and/or septicaemia. Thirteen serotypes distinguished by differences in the polysaccharide capsule of *N. meningitidis* have been described with groups A, B, C, Y and W135 accounting for the majority of meningococcal disease.

The BCPHMRL PHABM Program confirms isolates from blood, the respiratory tract, cerebral spinal fluid and conjunctiva submitted by microbiology laboratories for *N. meningitidis* and performs serotyping using sero-specific antisera. In BC, serogroups B (12%-43%) followed by Y (4%-26%) have been the cause of most infections from 2008 to 2013 (Figure 5). Meningococcal C vaccine and a quadrivalent vaccine covering groups A, C, Y and W135 are available while a vaccine covering some serogroup B strains has recently been approved for use in Canada.

Figure 5  
*N. meningitidis* serosubtyping results, 2008-2013, Public Health Advanced Bacteriology & Mycology Program, BCPHMRL.



Since 2012, *N. meningitidis* isolates have also been evaluated by E test® for antimicrobial susceptibility to ceftriaxone, ciprofloxacin, penicillin, rifampin and nalidixic acid. Resistant isolates have been observed for penicillin (8%) in 2012 and for nalidixic acid (4%) and ciprofloxacin (4%) in 2013. Penicillin-intermediate isolates have also been seen in 2012 (44%) and 2013 (39%) (Figure 6).

Figure 6  
*N. meningitidis* susceptibility results, 2012-2013, Public Health Advanced Bacteriology & Mycology Program, BCPHMRL. Antimicrobial MIC breakpoints are identified as S=susceptible, I=intermediate, and R=resistant.

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## Influenza Surveillance

Influenza testing volumes decreased in April from 242 tests in the first week to 105 in the last week of the month. Influenza A rates decreased to between 2-4% positivity in April until the last week when an outbreak of influenza A(H3) in a long term care facility accounted for half of the positive influenza A specimens. Influenza A(H3) (62%) was thus the dominant subtype in April followed by A(H1N1)pdm09 (38%). Rates of influenza B detection increased from the previous month to 6-19% before falling to 6% positivity during the last week of the month (Figure 7).

Nationally, rates of influenza A decreased in the month of April with the national average of less than 2% positivity. BC had a higher influenza A detection rate at the end of the month compared to the other provinces for reasons stated above (Figure 8). Influenza B rates have steadily increased in all provinces in April, peaking mid-month with detection rates from 8-22% in the provinces before decreasing again at the end of the month (Figure 9).

Figure 7  
Respiratory testing volumes and influenza detection rates, Virology Program, BCPHML.

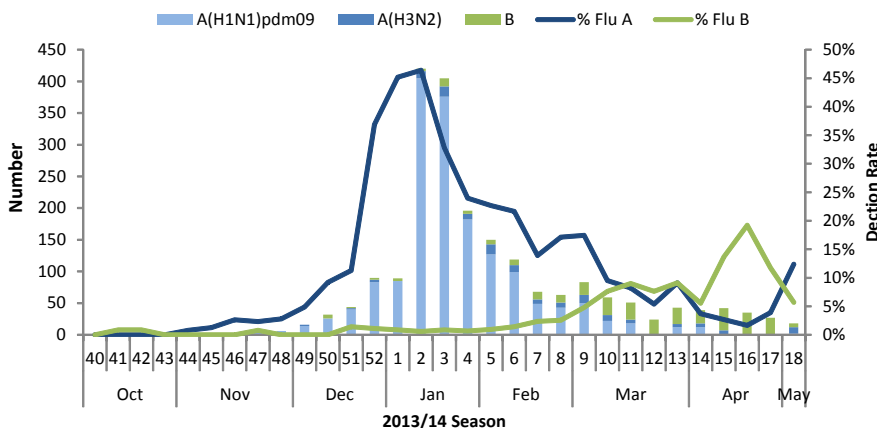


Figure 8  
Influenza A detection rates across Canada, October 2013 to present. Data derived from FluWatch reports.

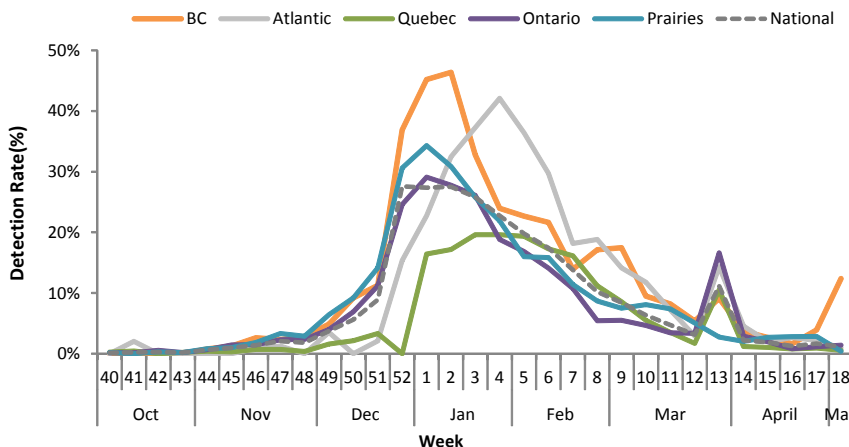
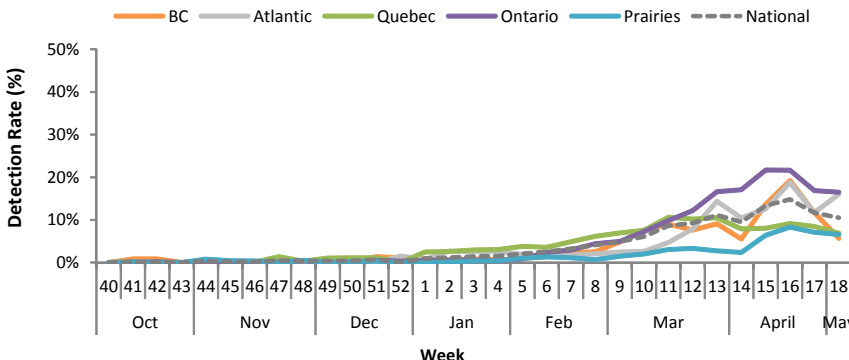


Figure 9  
Influenza B detection rates across Canada, October 2013 to present. Data derived from FluWatch reports.





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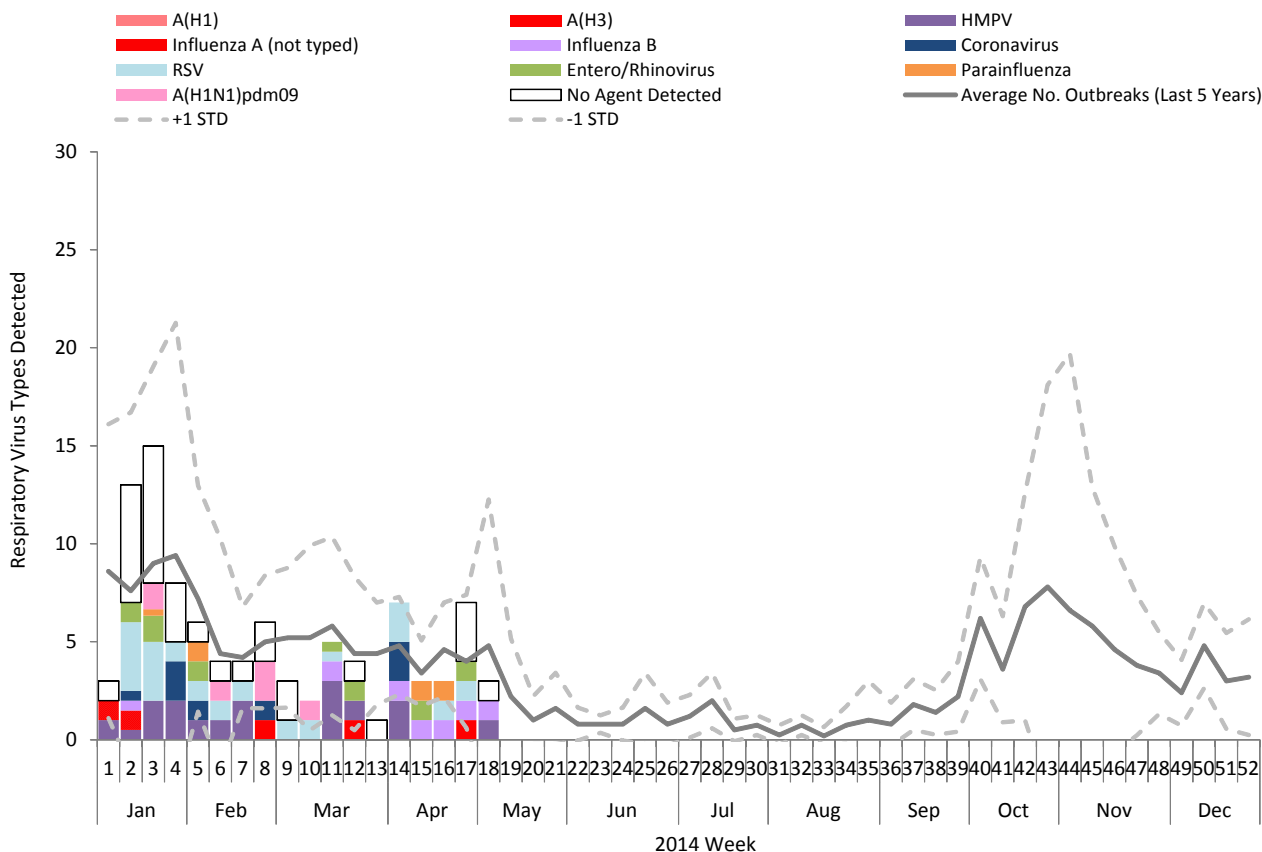
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## Respiratory Outbreaks

The number of respiratory outbreaks for the month of April were at the upper limit of previous years' investigations in weeks 14 and 17 (Figure 10). Samples were submitted to the BCPHMRL for 21 respiratory outbreak investigations from 18 (85%) longterm care facilities, 2 (10%) schools and 1 (5%) hospital outbreak. From the longterm care facility outbreaks, human metapneumovirus (HMPV), respiratory syncytial virus (RSV) and parainfluenza were each detected at 2 (11%) separate sites from 6 separate outbreaks. Influenza B was detected from samples from the two school outbreaks and RSV was detected from samples from the hospital outbreak.

Figure 10  
Respiratory outbreaks investigated\* in 2014, Virology Program, BCPHMRL.



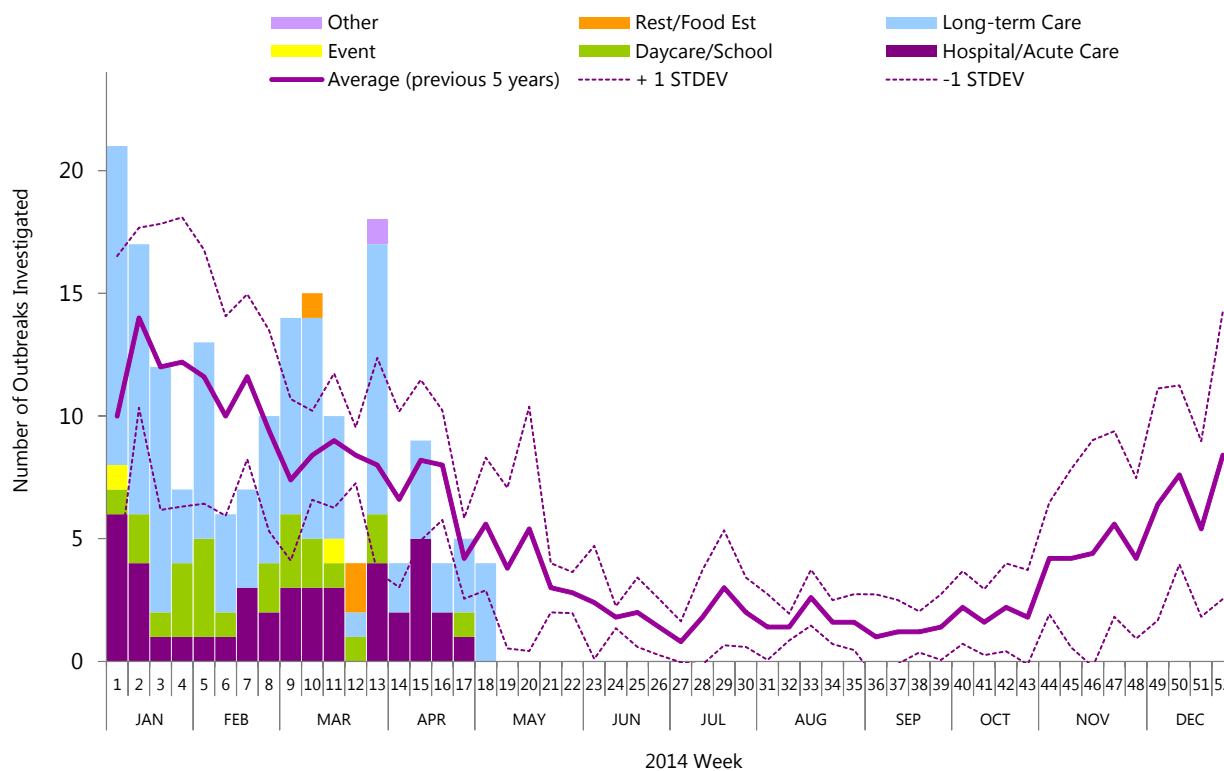
\* Figure 10 reflects respiratory sample results submitted for investigation to the BCPHMRL and may not be representative of respiratory outbreaks in the entire BC community.



## Gastrointestinal Outbreaks

In April, the BCPHMRL investigated 26 gastrointestinal (GI) outbreaks, a decrease from the previous month and approaching numbers consistent with this time in previous years (Figure 11). Outbreaks were identified from 15 (58%) longterm care facilities, 10 (38%) hospitals and 1 (4%) daycares/schools. Samples for laboratory testing were submitted for 22 (85%) of these outbreaks with norovirus confirmed in 19 (86%) from 10 (53%) longterm care facilities and 9 (47%) hospitals. Sapovirus was also identified in 2 (7%) separate outbreaks in longterm care facilities.

Figure 11  
Gastrointestinal outbreaks investigated\* in 2014, Environmental Microbiology, Public Health Advanced Bacteriology & Mycology, Parasitology and Virology Programs, BCPHMRL.



\* The data available are from outbreaks in which the BCPHMRL 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. Given the nature of GI



## A Report of the BC Public Health Microbiology & Reference Laboratory, Vancouver, BC

The BC Public Health Microbiology Reference Laboratory (BCPHMRL) at the BCCDC site provides consultative, interpretative testing and analyses for clinical and environmental infectious diseases in partnership with other microbiology labs and public health workers across the province and nationally. The PHMRL is the provincial communicable disease detection, fingerprinting and molecular epidemiology centre providing advanced and specialized services along with international defined laboratory core functions province-wide.

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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