PUBLIC HEALTH MICROBIOLOGY & REFERENCE LABORATORY

Vancouver, BC

LABORATORY TRENDS

January 20, 2012

In this Issue:

Laboratory News

Lean Response to Pandemic H1N1 (2009)

In 2009, the Public Health Microbiology & Reference Laboratory (PHMRL) applied a new method for the operational management of the H1N1 influenza virus pandemic. Faced with limited resources and unprecedented sample volumes, the team had to quickly develop mechanisms to apply a new assay for the novel virus.

Participation in past Lean management projects and having several Lean Leaders certified on the team meant that lean principles were at the forefront to improving services and making them more efficient. During routine testing when sample numbers are low enough, 2 laboratory staff are able to perform all necessary steps in influenza detection. This strategy would be inadequate for the quickly mounting pandemic volumes. A key to maintaining turnaround times was the use of *flow cells* which compartmentalized the steps involved in generating a laboratory result into discrete units. These cells increased output efficiencies since cells with shorter cycles could be performed more frequently and balanced those with longer cycle times.

Use of Lean principles in combination with years of pandemic preparedness enabled the PHMRL to expand laboratory surge capacity. The 2009 pandemic stressed the importance of flexibility and the need for novel ideas in the laboratory system. Lean methodology was found to be a tremendously useful approach to improving efficiencies.

The complete article can be found in January's issue of *Emerging Infectious Diseases*.

Laboratory Testing for Acute HIV Infection

Acute HIV infection (AHI) is typically defined as occurring within the first two months following infection. Individuals with AHI are estimated to account for 11-49% of new HIV infections. This is because viral loads are very high during AHI, patients often do not know they are infected so they are likely to continue risk activities which leads to secondary transmission. Identification of infection combined with counseling has been shown to alter risk behaviors and reduce transmission. It is estimated that for every AHI case identified, 1-2 secondary cases can be prevented.

In 2008, the CIHR funded a five year multi-disciplinary study at the BC Centre for Disease Control/PHMRL to improve AHI detection among men who have sex with men and to develop prevention strategies to enhance knowledge of HIV status in order to reduce HIV transmission. Part of this study involved HIV antibody screening of at-risk individuals with both the 3rd and 4th generation antibody tests and when these tests were negative, testing pools of the residual sera for HIV RNA by PCR to identify pre-seroconversion HIV infections.

The application of PCR to confirm acute HIV infection in individuals with weakly reactive anti-HIV serology enabled the laboratory to identify 34 AHIs in the last 27 months and facilitated early counseling. We estimate that even if 1 secondary transmission was averted per identified case, between $8,500,000-$17,000,000 in future health costs were averted (lifetime costs of HIV infection are estimated to be $250,000-$500,000 per person). Laboratory-based AHI detection is one of the many tools that support the Province's Stop HIV/AIDS - Seek and Treat Strategy.

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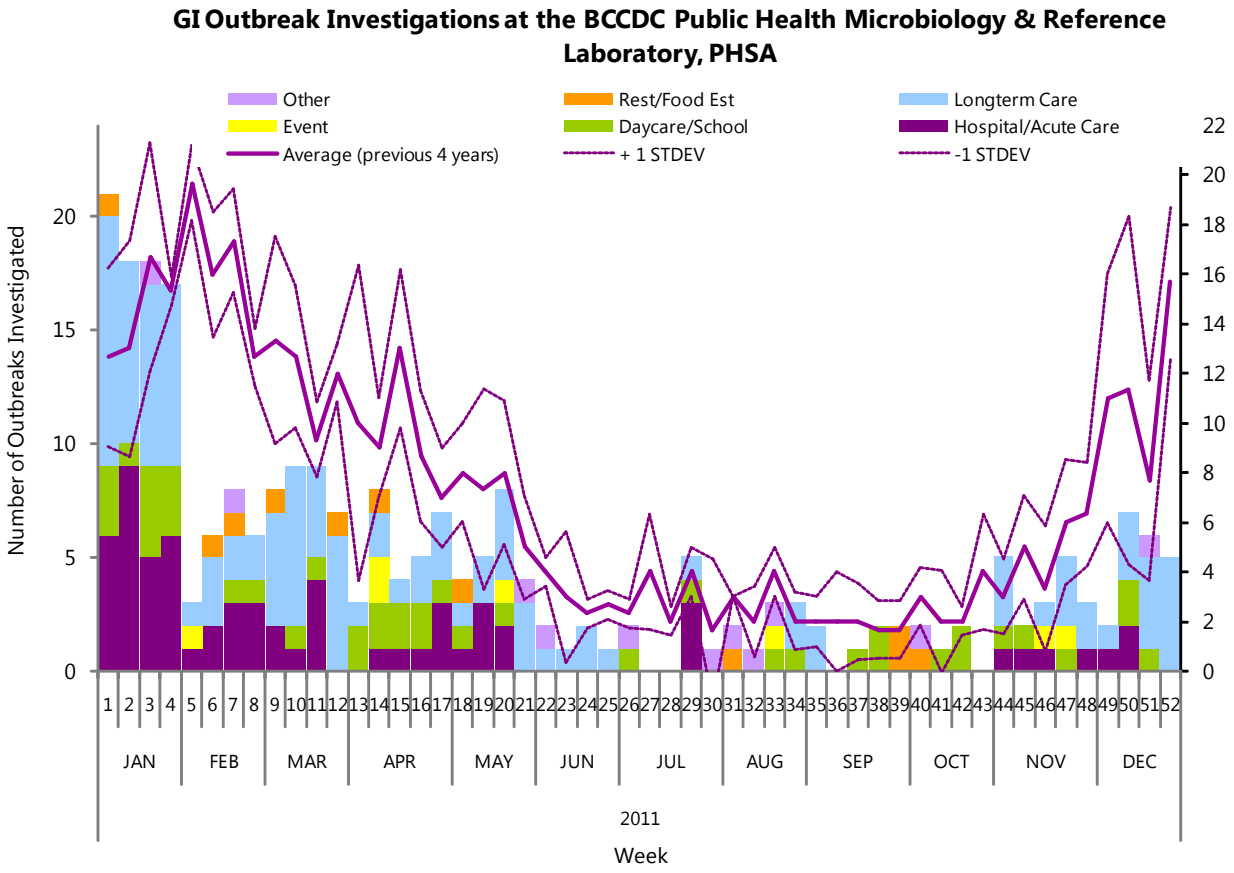
Gastrointestinal Outbreaks

In December, there were 22 gastrointestinal (GI) outbreaks investigated at the PHMRL. December is typically the start of norovirus season but fewer outbreaks have been investigated this month than the average in previous years (Figure 1). Outbreaks were identified from 13 longterm care facilities, 2 daycare/schools, 3 hospitals, and 2 other locales (Figure 1). Samples for laboratory testing were submitted for 18 of these outbreaks. Of these, norovirus was confirmed in 11 outbreaks, rotavirus in another, while 6 outbreaks had unknown etiologies.

The data available are from outbreaks in which the PHMRL has been notified. Some acute care microbiology laboratories are also testing for norovirus in the province and these data do not include outbreaks from Vancouver Island Health Authority. Given the nature of GI outbreaks, samples are not always available for testing.

Figure 1 _____
Gastrointestinal outbreaks investigated since January, 2011, Environmental Microbiology, Bacteriology & Mycology, Parasitology and Virology Programs, PHMRL.



Enteric Surveillance

Nearly 1200 cases of *Salmonella* were identified in 2011. After *Salmonella, Campylobacter* is the second most common enteric pathogen identified at the PHMRL (Figure 2) but remains the leading provincial cause of enteric bacterial illness. In 2011, *Salmonella* Enteritidis accounted for about 42-63% of all *Salmonella* species isolated at the PHMRL while the next most common serovar, *Salmonella* Typhimurium, accounted for 1-13% of *Salmonella* cases each month (Figure 3). The summer months saw particularly high rates of *S. Enteritidis* isolations and several clusters were also noted by molecular fingerprinting. Fingerprinting has further confirmed the cluster of *S. infantis* in Vancouver Coastal Health as reported in January's *Health Watch*. Cases had specimens taken from mid-November to the end of December, 2011.

Figure 2
Enteric organisms identified from clinical samples in 2011, Bacteriology & Mycology Program, PHMRL.

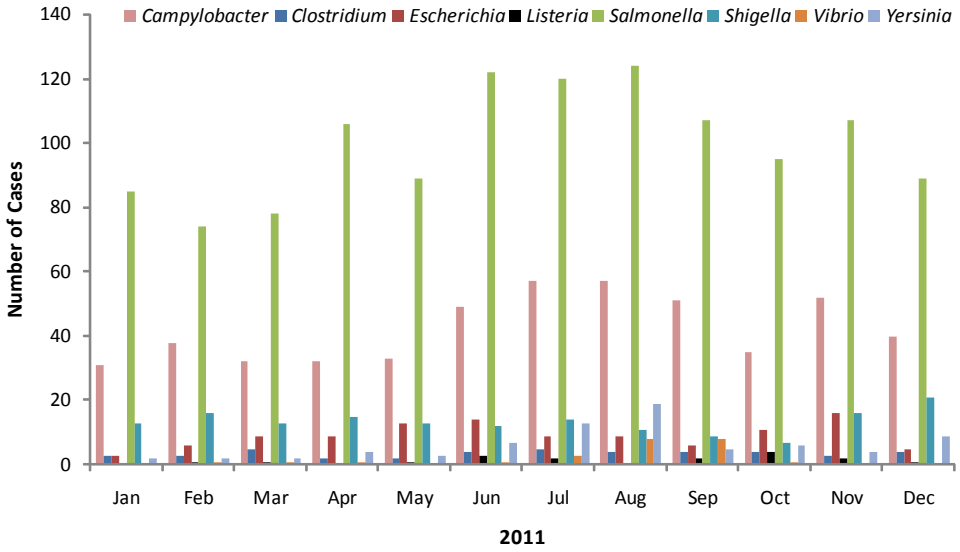
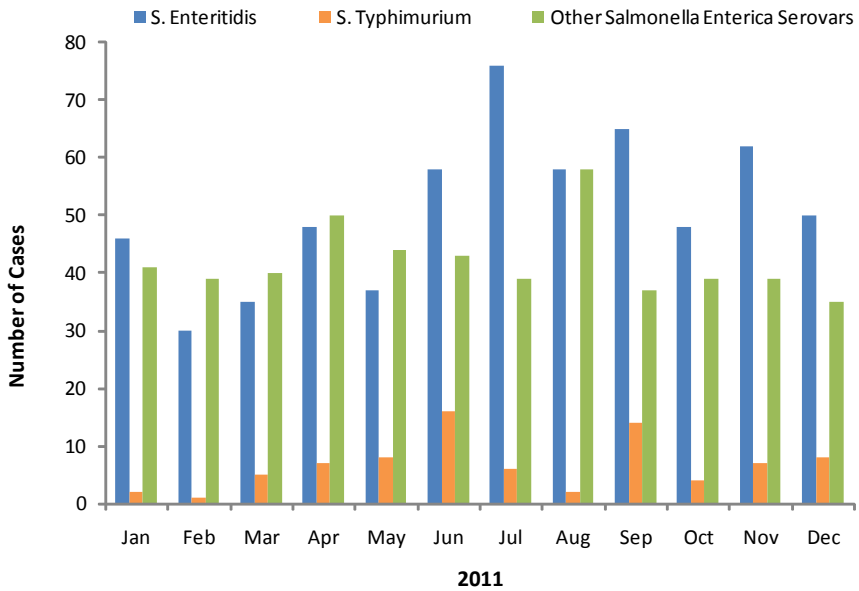


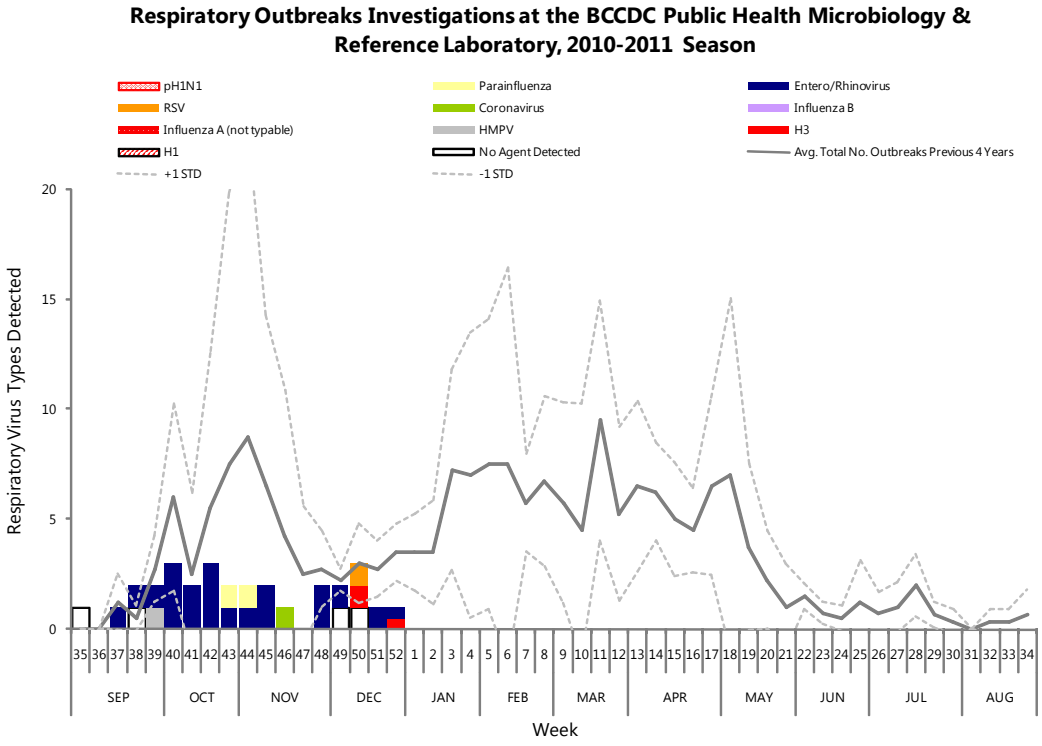
Figure 3
Salmonella Enterica serovars isolated in 2011, Bacteriology & Mycology Program, PHMRL.



Respiratory Outbreaks

In December, samples were submitted from 9 longterm care facilities for outbreak investigation at the PHMRL (Figure 4). Using PCR and Luminex methods, enterovirus/rhinovirus were detected in 3 facilities, influenza A(H3) detected in 2 facilities and RSV detected in the remaining facility. Figure 4 reflects respiratory sample results submitted for investigation to the PHMRL and is not representative of respiratory outbreaks in the entire BC community.

Figure 4 _____
Respiratory outbreaks investigated by respiratory season, Virology Program, PHMRL.

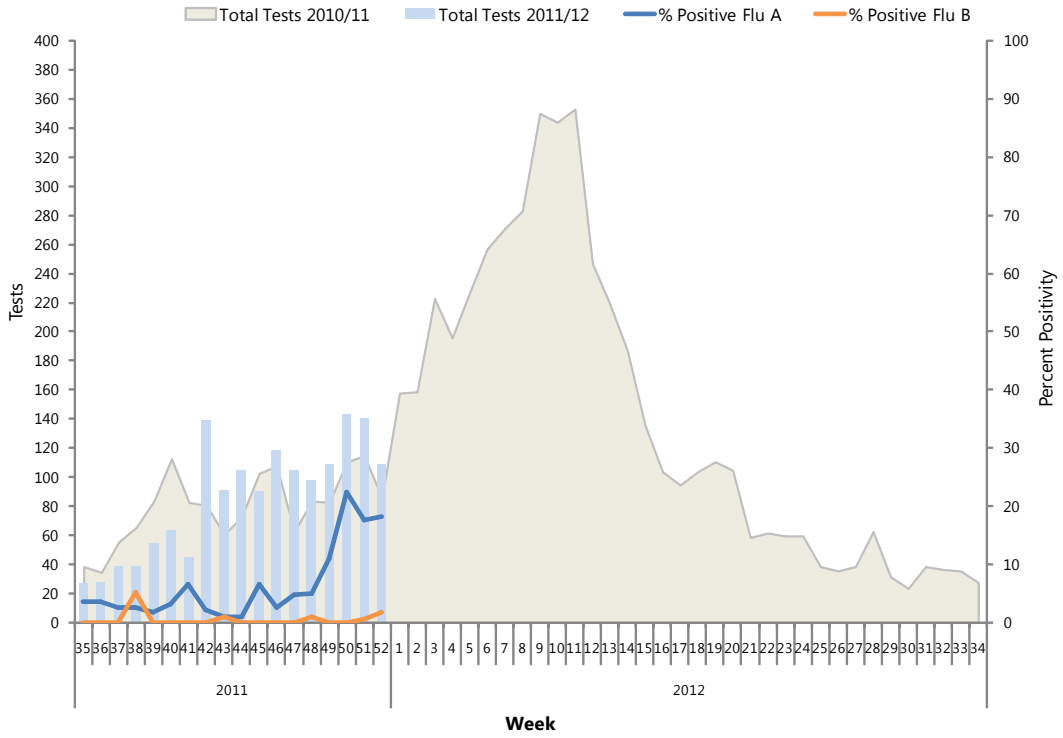


Influenza Surveillance

Volumes for respiratory testing have been consistently higher than this time last season for weeks 49-52 (Figure 5). Influenza positivity has increased since week 50. Influenza A (H3N2) was the major virus type detected this period with 98 (18.5%) positive specimens (Table 1). There were also 3 positive influenza B (0.6%) specimens during this time.

National influenza trends are seeing low levels of activity in Eastern Canada (Ontario and Quebec) while activity is increasing in Western Canada (BC and Saskatchewan). More information can be found on the FluWatch website at http://www.phac-aspc.gc.ca/fluwatch/index-eng.php.

Figure 5
Respiratory testing volumes and influenza percent positivity, Virology Program, PHMRL.



The World Health Organization (WHO) reports that, globally, there is sporadic influenza activity with the dominant subtype being influenza A(H3N2). The influenza season seems to have begun in some areas of Europe and North Africa while other countries in the northern hemisphere continue to see low levels of activity (WHO, 6 Jan 2012 Update). To date in the US, 11 human infections with a variant influenza A(H3N2) virus with genes from swine, human, and avian lineages were found in addition to a case with a influenza A(H1N2) variant that circulates in swine.

Table 1
Positive influenza A and B detections for weeks 49-52 (December 4-December 31, 2011, Virology Program, PHMRL. (H1N1)pdm09 refers to the 2009 influenza A(H1N1) pandemic virus.

	Week 49	Week 50	Week 51	Week 52
Number of Specimens Tested	**113**	**146**	**146**	**124**
Number of Positive Specimens	**12 (10.62%)**	**32 (21.92%)**	**27 (18.49%)**	**30 (24.19%)**
Influenza A	12 (10.62%)	32 (21.92%)	26 (17.81%)	28 (22.58%)
(H1N1)pdm09				
sH3N2	*12 (10.62%)*	*32 (21.92%)*	*26 (17.81%)*	*28 (22.58%)*
Not typeable				
Influenza B			1 (0.68%)	2 (1.61%)

Streptococcus Surveillance

Pneumococcal diseases are a major public health problem globally and in Canada causing a number of illnesses including bacteremia, meningitis, sepsis and pneumonia. The Bacteriology & Mycology Program works closely with front-line microbiology laboratories in BC and with the National Microbiology Laboratory (NML) to provide these data.

Figure 6

Streptococcus pneumoniae isolates forwarded to the Bacteriology & Mycology Program, PHMRL, 2008 to present

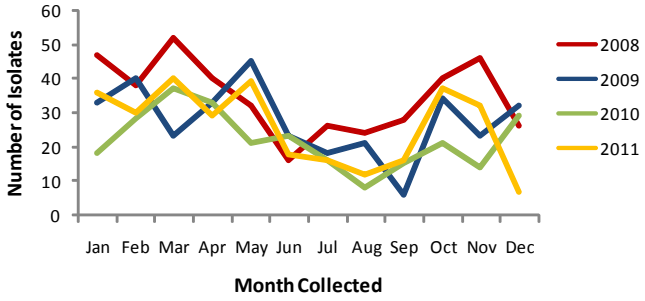
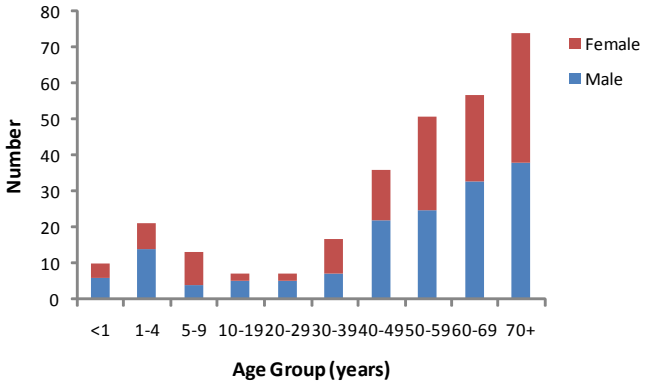


Figure 7

Ages of invasive pneumococcal disease cases and gender ratios submitted to the Bacteriology & Mycology Program, PHMRL, 2011 to present



With the exception of the month of December, test volumes for *Streptococcus pneumoniae* submissions in 2011 have been consistent with previous years' volumes demonstrating typically higher number of cases in the cooler months (Figure 6). *S. pneumoniae* frequently affects the elderly and young children but individuals of all ages are affected; young males and elderly males also seem to be preferentially affected (Figure 7).

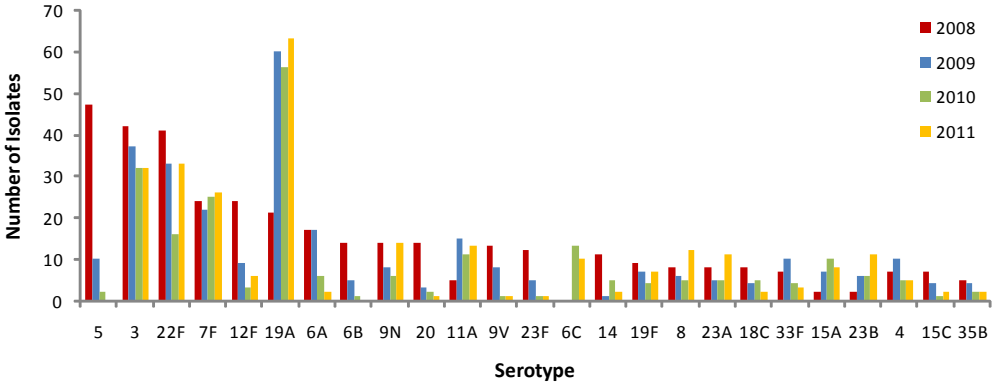
Table 2. British Columbia pneumococcal vaccination history.

Vaccine	Implemented	Serotypes Covered
PCV 7	April, 2003	4, 6B, 9V, 14, 18C, 19F and 23F
PCV 13	June, 2010	Above + 1, 3, 5, 6A, 7F and 19A

More than 90 known serotypes *S. pneumonia* can cause invasive pneumococcal disease (IPD). After preliminary serotyping is performed, the Bacteriology & Mycology Program forwards invasive isolates to our reference centre at the NML for further subtyping. The leading serotype from 2009-2011 has been 19A, accounting for 18-21.5% of all serotypes subtyped (Figure 8). 19A has been included in the PCV 13 vaccine which includes an additional 6 serotypes to the previous PCV 7 vaccine (Table 2). Also included are the next most prevalent serotypes, 3 and 7F, however, it appears that serotype 22F is also contributing to a large portion of invasive disease.

Figure 8

Occurrence of top *Streptococcus pneumoniae* serotypes submitted to the Bacteriology & Mycology Program, PHMRL, 2008 to present



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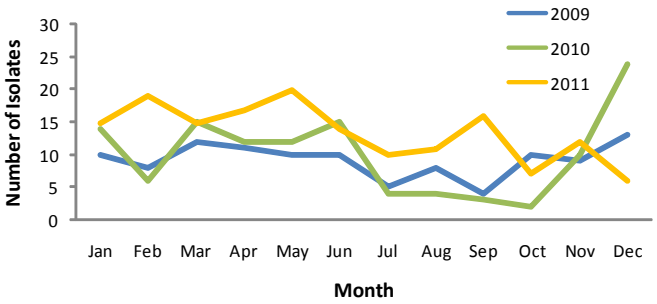
On average, with the exception of October and December, the number of isolates sent to the PHMRL for invasive Group A *Streptococcus* (iGAS) was higher each month in 2011 than in previous years (Figure 9).

Figure 9
Streptococcus pyogenes (iGAS) isolates forwarded to the Bacteriology & Mycology Program, PHMRL, 2009 to present



The National Microbiology Laboratory serotypes *Streptococcus pyogenes* by both the M protein virulence factor (*emm* typing) and by the surface T antigen (T-typing). There are over 100 *emm* types and 20 T-types known. The most common serotypes seen in BC are as shown in Figures 10 and 11. About 30% of the iGAS isolates submitted in 2011 have been *emm* type 1 and T-type 1. The next most prominent serotypes seen in BC are emm type 12 and T-type 12. *emm* and T-types appear to be conserved for *emm* serotype 1, 12, 6 and 4 (Figure 12).

Figure 10
Top *Streptococcus pyogenes* (iGAS) emm serotypes, submitted to the Bacteriology & Mycology Program, PHMRL 2009 to present

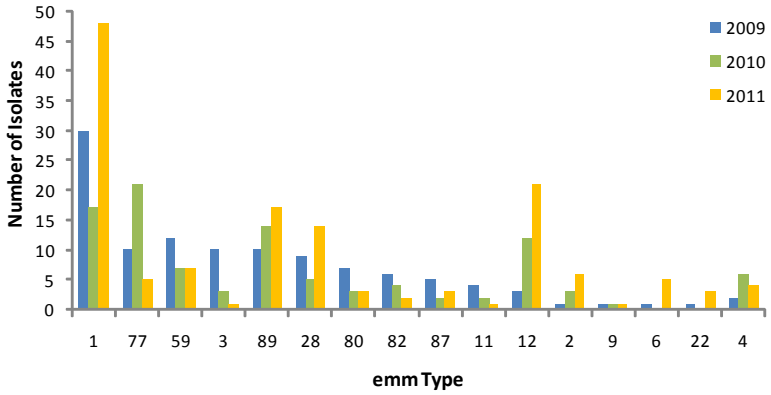


Figure 12
Most common *Streptococcus pyogenes* (iGAS) emm types and their corresponding t-types, submitted to the Bacteriology & Mycology Program, PHMRL, 2011.

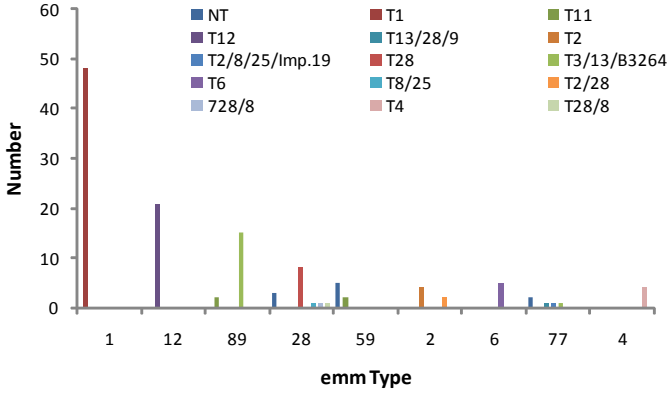
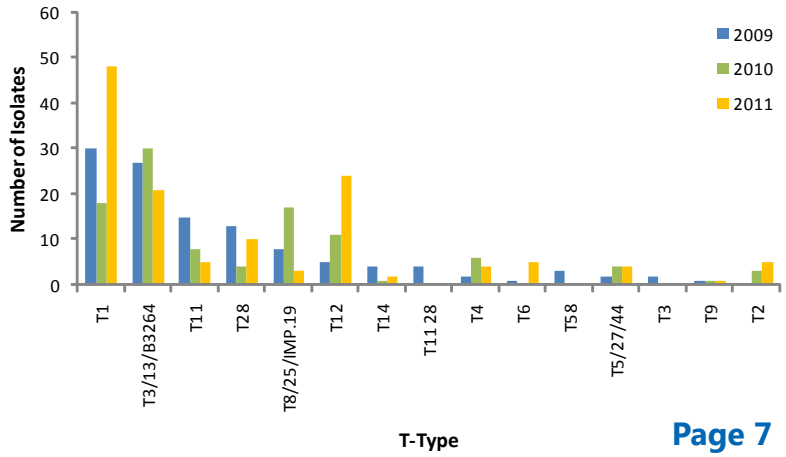


Figure 11
Top *Streptococcus pyogenes* (iGAS) T serotypes, submitted to the Bacteriology & Mycology Program, PHMRL 2009 to present



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