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CONGENITAL SYPHILIS IN CANADA:

Insights and Implications
for the Lab

Q&A:
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Congenital Syphilis in Canada: Insights and Implications for the Lab

Syphilis is a sexually transmitted infection (STI) that often conjures up historical imagery, as the disease was common and sometimes deadly before the advent of antibiotic treatment. Today, syphilis is effectively treated with simple penicillin, yet syphilis is on the rise in Canada, and several different factors appear to be involved.

Syphilis was once more common among men who have sex with men. But today there is a greater proportion of cases occurring in heterosexual men and women, and among women of childbearing age in particular. According to the Public Health Agency of Canada, there were 13,953 cases of syphilis recorded in 2022. This represents an 11% rate increase since 2021 and a 109% rate increase since 2018.¹ Cases among women aged 15-39 have also been increasing across the country.

This has resulted in more cases of congenital syphilis, a syphilis infection transmitted from mother to unborn child during pregnancy. Congenital syphilis can cause stillbirth, premature birth, and many clinical signs and symptoms in babies. Some experts are calling for increased screening for at-risk populations, while others think universal screening at multiple points during pregnancy is the way to go. Either way, we can expect more lab resources dedicated to testing for syphilis.

With this once-rare disease on the rise, it's important for laboratory scientists to be aware of trends, continue to learn new methods, and be prepared for more testing.

Syphilis transmission, treatment, and staging

Syphilis is a sexually transmitted blood-borne infection caused by the bacterium *Treponema pallidum*. It is transmitted by contact with a syphilitic sore known as a chancre, which can be found on a person's genitals, anus, rectum, or mouth.² Pregnant women can transmit the infection to their unborn child during pregnancy through the placenta, and it can also be transmitted during childbirth if sores are present in the birth canal. Syphilis can be effectively treated with a single injection of a long-acting form of penicillin.³ Some people may require multiple injections to clear the infection.

Syphilis develops in four stages, each of which has different symptoms.⁴ In the primary stage, chancres appear. In the secondary stage, a person may experience a rash on the palms of the hands and soles of the feet as the disease becomes disseminated. In the latent stage, the bacteria stay in the body without



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Dr. Jared Bullard

causing symptoms. Tertiary syphilis may develop later, causing serious cardiovascular problems, mental symptoms, blindness, and sometimes death.

Reasons behind the recent rise in cases

Syphilis has been increasing in Canada for decades, and the rate of infections has tripled since 2017. Alberta, Manitoba, Saskatchewan, and the Northwest Territories are the most affected by increasing rates. A variety of factors are contributing to the rise in syphilis in Canada. According to Health Canada, both

social determinants of health and modifiable risk factors play a role in the spread of syphilis.⁵

Social determinants of health include poverty, discrimination, insecure housing, mental health factors, and lack of access to health care. In Canada, syphilis is much more common in members of the Indigenous population who are more likely to be affected by these factors due to the systemic discrimination they experience. Modifiable risk factors include having sex with multiple partners or anonymous sex. Substance use is another significant contributor.

“Socio-economic factors, such as income disparities and educational gaps, can create barriers that hinder certain communities’

“ We’re increasingly running into a problem of re-infection. So, we find women and birthing parents early in pregnancy. We give them treatment, they respond appropriately. But because we have so much disease in our population, these women will get re-infected, particularly if their partners aren’t necessarily treated. ”

access to adequate health care services, including testing and treatment for syphilis,” says Anna Maddison, a spokesperson for the Public Health Agency of Canada.

An initial rise in syphilis infections was attributed to changes in sexual behaviour driven by widespread dating app usage. Condom use is also on the decline, possibly driven by the introduction of highly effective HIV treatments and prophylaxis.⁶

Health Canada is taking steps to help reduce the impact of syphilis in Canada, Maddison says: “The Government of Canada is working with and supporting community-based

organizations, Indigenous partners, provinces and territories, researchers, and the health sector.”

This includes funding outreach organizations and testing initiatives within underserved communities and hard to reach populations. PHAC also publishes evidence-based guidelines to support health care providers in managing syphilis.

A concerning increase in congenital syphilis

Alongside the recent rise in syphilis is a marked increase in congenital syphilis, a syphilis infection transmitted from mother to unborn child during pregnancy. In 2022, Canada reported 117 cases of confirmed early congenital syphilis, compared to just 7 cases in 2017.⁷ In a preliminary study of 165 infants exposed to syphilis in Canada, 45% were born to Indigenous mothers.⁸ Congenital syphilis can cause a number of clinical signs and symptoms in babies, including lifelong physical and mental disability. It can also cause miscarriage, premature birth, and stillbirth.

Dr. Jared Bullard is section head and consultant for pediatric infectious disease at the Winnipeg Children’s Hospital. Bullard’s professional interests include congenital syphilis, syphilis diagnostics, and STBBI prevention. In a 2023 webinar for the CSMLS Insights Speaker Series, Bullard discussed the state of congenital syphilis in Canada. Bullard has seen firsthand the effects of rising syphilis on mothers and babies.

“We’re increasingly running into a problem of re-infection,” Bullard says. “So, we find women and birthing parents early in pregnancy. We give them treatment, they respond appropriately. But because we have so much disease in our population, these women will get re-infected, particularly if their partners aren’t necessarily treated.”

Transmission can occur during pregnancy or during delivery if there are chancres present in the birth canal. *T. pallidum* can infect the fetus any time after the ninth week of pregnancy, and it can cross the placenta. Syphilis can also infect infants through breastfeeding.⁹ Adverse outcomes tend to be more severe with primary or secondary maternal syphilis.

Congenital syphilis can be asymptomatic, and most infants do not present with symptoms at the time of delivery. Symptoms most often appear between 3-14 weeks of age but may occur at any time within the first two years of life.

“Typically, we see them in the first week or two after they’re delivered,” Bullard explains. “A lot of the time, they have no clinical findings at all. But if we were to allow them to develop clinical symptoms, they would occur usually by about three months, with most coming in around that one-month mark.”

The symptoms of congenital syphilis include rhinitis, enlarged liver, jaundice, skin rash with desquamation, skeletal abnormalities, ocular abnormalities, and hematological issues including anemia and thrombocytopenia.

When untreated, infants may develop late-stage manifestations of congenital syphilis. Late-stage symptoms may include facial and skeletal malformations, dental malformations, hematological issues, neurological

complications (including intellectual disability and seizures), hearing loss, and ocular abnormalities.

“It’s typically over the age of two where you have a lot of damage done by treponemal infection scarring,” Bullard explains. “And it’s permanent. It doesn’t go away.”

Syphilis screening methods

Screening for syphilis involves serology, as *T. pallidum* is only visible with dark field microscopy. Syphilis serology has two components: nontreponemal and treponemal tests. Nontreponemal tests screen for markers of syphilis but not directly for syphilis, while treponemal tests look for the presence of *T. pallidum*. Traditionally, nontreponemal tests were used initially to screen for possible syphilis, and treponemal tests were used to confirm a diagnosis after a positive nontreponemal test. Treponemal tests tend to be more expensive and resource-intensive.

However, today it is becoming more common for labs to test with a treponemal test initially and confirm with a nontreponemal test and a second treponemal test.¹⁰ This is partially because of the

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high false positive rate from nontreponemal tests.

The most common nontreponemal tests are Rapid Plasma Reagin (RPR) and the Venereal Disease Research Laboratory test (VDRL) test. RPR tends to be more common in Canada. These tests are inexpensive and widely available, but they can produce false positives, so additional testing is required after a positive.

“The other explanation for doing the treponemal test first is you kind of eliminate most of those false positives, and you also gain automation,” Bullard explains. “So anytime you can do a test that’s

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There are several types of treponemal tests used to detect *T. pallidum* antibodies. Enzyme immunoassays and chemiluminescence immunoassays can detect *T. pallidum* antibodies in patient serum. These are suitable for high-throughput screening, and are typically the first treponemal test of choice.

If a second treponemal test is required, there are several options. The fluorescent treponemal antibody absorption test (FTA-ABS) uses the indirect fluorescence antibody technique. The treponema pallidum particle agglutination test (TP-PA) is an assay using *T. pallidum* antigens mixed with serum to detect a clumping (agglutination) reaction. Treponema pallidum enzyme immunoassays (TP-EIAs) are another option used for both screening and confirmation. Finally, western blot can be used in unclear cases, as it has very high specificity.

Looking to the future

For the prevention of congenital syphilis, regular screening and prompt treatment are key. This can be a challenge for marginalized and underserved populations. Because of the problem of re-infection, Bullard hopes screening will be expanded to take place at multiple points during pregnancy.

“We started doing routine STI testing in the first trimester here in Manitoba and that was back in 2016. We also know that in Manitoba we had about 17,000 pregnancies and the cost of screening is about 140,000 per year,” he explains.

“So, when you think about that, the short-term cost of having congenital syphilis cases treated, followed, over the course of a year is about \$18,000, [and with the number of cases we have] that means you spent about \$1.5 million in 2021 here in this province alone. So, you can see that there actually is a really good cost avoidance and that if we were to screen women and birthing parents multiple times throughout pregnancy, it is cost-effective.”

Maddison says to expect an increase in specimen volumes for syphilis serology and direct detection methods as more people are tested.

“Newer tests and methods may continue to be introduced in the near future, especially as the need for rapid point-of-

care testing continues to rise due to the challenges faced by at-risk groups,” she says.

Addressing the syphilis crisis requires a concerted effort from all corners of the healthcare system, and the laboratory plays an especially important role. Catching and treating syphilis early is key to preventing the negative outcomes associated with congenital syphilis. Increasing awareness and accessibility of testing and treatment for high-risk populations will also contribute to better outcomes. With a shared commitment to public health, we can turn the tide and move toward a future where congenital syphilis is truly a thing of the past. ■



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Special to the CJMLS

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