The Perinatal Times

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The Psychosocial Side of Syphilis

By: Jilliam Root, MPH, CPH & Suzanne Alexander, MPH, CPH

Think back to a time where you had a doctor's visit scheduled. Maybe it was for an annual physical, or a runny nose. Let's imagine your job is understanding and gives you the time you need to take care of yourself. You schedule the appointment at 9:30 am, allowing just enough time to sleep in and just enough time to return to work after lunch. The car has enough gas to get there… and back. The only thing that may be on your mind is that pesky copay, but you can tell them to just bill it to your account. For many of us, these are all things we do not have to think too much about or can plan ahead for. For others, the biggest challenge may simply be finding the right time to go.

What if you couldn't afford to take time off work? What if your job isn't understanding that this was the only appointment available? What if your gasoline budget is so tight that you will be running on an almost-empty tank before your next payday if you have to drive somewhere else? What if it was a four mile walk from the bus stop to the clinic, and you're seven months pregnant?

Imagine having to consider all of those factors: making the appointment, finding time off work, getting to the appointment (on time), and how to pay for it. Now imagine having to figure this out for three separate appointments, scheduled three weeks in a row.

Syphilis has some of the most detrimental consequences, but for most women the initial symptoms often disappear. When there is barely enough capacity for a woman to make it through the day, something that appears to go away on its own won't get a whole lot of attention. It is 100% curable, but women are still giving birth to babies diagnosed with congenital syphilis - which carries long term harm and often causes miscarriages or stillbirth. Providers all over the country wonder why the number of new infections is continuing to rise. But when you are a public health professional, you understand that there is a story behind every diagnosis. For those of us trained to look for these answers, we can offer some clarity about the social drivers impacting women's health.

In St. Louis, we've identified populations that are unhoused and nomadic, who struggle with substance use, engage in transactional sex for food and money, and have little to no access to prenatal care. We've identified fears associated with child services, rehabilitation centers, the criminal legal system, and government officials. Shamefully, these are not unfounded fears. St. Louis is a city divided by racism, with a history of exploitation by authority figures[1]. Black and poor women in St. Louis have learned how to hide from those they do not trust. If you cannot find them, how can you help them? How do we reduce the fear and earn trust as health professionals? How do we stop failing our community?

Let's unpack the problem a little bit more. Syphilis is treated with an antibiotic called Bicillin, that requires three doses, each provided a week apart from each other. Because the symptoms of syphilis are often invisible, women may discover their diagnosis at an emergency room or urgent care visit for other causes. Sometimes the cause of those visits is an unexpected pregnancy. Now there is an additional timeline involved - if a woman can receive those three treatments before delivering her baby, the potential damage that can be done is reversed. How do you find someone with no home? As health professionals we need to understand the importance of meeting someone where they are at (metaphorically and physically) and prioritize earning their trust and supporting their capacity.

It's going to take creativity, innovation, and drive. A joint effort between the City of St. Louis Department of Health and the Saint Louis County Department of Public Health has been gathering all the involved partners to form a cross-sectional collaborative, reviewing every case of congenital syphilis for missed opportunities, and researching ways to address all the themes, barriers, and best practices involved with helping women develop the capacity to receive treatment in a timely manner. Everything is reviewed from regular affordable health care down to reliable transportation. We've learned a lot.

The Psychosocial Side of Syphilis (cont.)

Combating syphilis and congenital syphilis will take a multi-pronged effort. Clinicians need to be detectives, finding ways to maintain contact with their patients experiencing unstable housing. A list of references to social support organizations would be very helpful for clinicians to maintain in their offices. Following up on lab reports by reaching out to Disease Investigation Services (DIS) will help expedite contact tracing and would also allow additional social support to be provided. Let's not forget that communication is key.

In other words, as in all perinatal care, it really does take a village. Partnering with public health professionals can increase the reach and care for the most underserved patients, and lead to better outcomes. All of the entities, from clinics to social services, should lean on their public health departments as we hope to bridge the divide that perpetuates our problems. Challenge yourself, by remembering that mom who cannot find transportation to just get a shot. Remember that mom who gave birth and abandoned her child due to fear of imprisonment. Remember that we are here to support your mission of healthy patients and improved outcomes. We are here to not only protect these vulnerable populations, but to uplift a community where there is more to life than just surviving.

[1] *For example, the cold war radiation spraying of Igoe-Pruitt. Other issues include the Bridgeton Landfill and the uranium disposal sites left by Mallinckrodt Chemical.*

The SSM Health Perinatal Outreach Program

The Perinatal Outreach Program is a collaborative effort between SSM Health St. Mary's Hospital – St. Louis, SSM Health Cardinal Glennon Children's Hospital, and Saint Louis University School of Medicine.

It is designed to improve outcomes for mothers and babies through educational programs and quality improvement activities for regional perinatal care providers in Eastern Missouri and Southern Illinois.

SSM Health Cardinal Glennon Children's Hospital and SSM Health St. Mary's Hospital – St. Louis are designated by the Illinois Department of Public Health as the Administrative Perinatal Center for Southern Illinois.

Continuing Education Opportunities

Many continuing education opportunities, including traditional lectures, hands-on skills sessions, as well as online presentations are available for perinatal professionals in eastern Missouri and Southern Illinois. For course calendars or more specific information on programs, please visit ssmhealth.com/perinatal outreach, call the Perinatal Outreach Program at 314-577-5317, or send an email to: SSM-PerinatalOutreach@ssmhealth.com

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Jilliam Root, MPH, CPH- Author

Jilliam Root is a Public Health Educator, in the Maternal and Child Health Bureau for the City of St. Louis Department of Health. Jilliam has her Masters degree in Public Health in Maternal and Child Health and Global Health, and currently attends Goldfarb School of Nursing for her Bachelor's degree in Nursing. Her future goals are to become an emergency department nurse and public health nurse and continue to combine clinical knowledge and community awareness to improve the health of her beloved birthplace, St. Louis. She is a strong advocate for emphasizing the intersectionality of social drivers impacting our community and their health. She believes that if you look at health from a singular lens, you'll never receive the answer you are searching for. You'll never find the solution. Find out what the story is! One of her most prized side quests is continuing to coach high school volleyball and stay connected to our teen populations! A quote she lives by is "Adversity shakes the foundations of our character to see if what we believe, and value, is really worth standing for." - Rae Smith.

Suzanne Alexander, MPH, CPH- Co Author

Detroit native and mother of three, Suzanne Alexander turned her mid-life crisis into a Masters of Public Health at Saint Louis University where she focused on health equity and population health. She graduated at 49 shortly before the lockdown and became a COVID-19 investigator before serving as the Bureau Chief of Communicable Disease throughout the COVID-19 and Mpox public health emergencies. She is currently piloting the Program Evaluation and Data Metrics section at the City of St. Louis Department of Health as well as serving as the DOH principal investigator for the City and County's Joint Task Force on Congenital Syphilis. She sits on the Missouri State Congenital Syphilis Case Review and Advisory Group boards. Falling in love with Saint Louis because of its similarities to her native city, she strives to be a humble ally, a good steward of agency resources, and an advocate for focusing public health efforts on healing-centered engagement. She is an empty nester except for a very spoiled dog. Let's Go Blues!

Congenital Syphilis

By: Megan Ottomeyer, DO, MS

Congenital Syphilis is a preventable disease in newborns with consistent increase in incidence in the United States since the year 2003 (Thean, Moore, & Nourse, 2022) making its prevention and treatment an increasingly important topic in pediatrics and neonatology. Understanding congenital syphilis transmission, pathophysiology, clinical presentation, diagnosis, and treatment is imperative for those providing care to newborns as this disease becomes more common, with an estimated 1 in every 1300 live births being affected by congenital syphilis in the United States in the year 2024 (Stafford, Workowski, & Bachmann, 2024) and 102.5 cases of congenital syphilis per 100,000 live births in 2022 (*Sexually Transmitted Infections Surveillance, 2022*, 2024). This worsening public health crisis is especially prevalent locally, with the state of Missouri reporting 118.1 cases of congenital syphilis per 100,000 live births ranking 15th in the nation and Illinois reporting 64.3 cases per 100,00 live births ranking 24th in the nation in 2022. Additionally, both Missouri and Illinois as well as the entirety of the United States had significantly increased rates of congenital syphilis since 2018 (*Sexually Transmitted Infections Surveillance, 2022*, 2024).

Congenital syphilis is caused by transplacental transmission of maternal syphilis infection to the fetus during pregnancy or through direct contact with infectious lesions during the birthing process("Syphilis," 2021). Maternal syphilis infection occurs when the causative bacterium, *Treponema pallidum*, invades maternal tissues, typically through sexual contact ("Syphilis," 2021). *T pallidum* is a thin, motile, spirochete bacterium, that readily invades host tissues through small abrasions or directly penetrating host cells, using a hyaluronic acid degrading enzyme as well as its flagella (Radolf, 1996). Once adherent to a host cell, *T. pallidum* rapidly divides and continues to adhere to and invade host tissues. While *T. pallidum* can attach to any host cell during this process, the bacterium shows a particular preference for attachment to endothelial cells (Radolf, 1996).

T. pallidum itself does not produce any toxins to damage host tissues after invasion. Instead, destruction of host tissues is due primarily to the inflammatory response of the host to the invasion of cells. Invasion of host cells by *T. pallidum* leads to both a cellular and humoral immune response of the host, with over 60 antibodies reacting in the process. *T. pallidum* is able to bind to any type of host cells, and this profound inflammatory response leads to destruction and necrosis of bound cells, leading to the clinical presentations of the disease (Radolf, 1996).

Not only is *T. pallidum* able to stimulate a robust host inflammatory response to case cellular destruction, it is also able to balance this immune stimulation with the ability to deftly evade eradication by the host immune system (Radolf, 1996). The unique nature of *T. pallidum*'s cell membrane allows for this phenomenon. The outer cell membrane consists of poorly immunogenic proteins, allowing T. pallidum to covertly evade host immune detection and response, while the inner cell membrane contains highly immunogenic lipoproteins, stimulating host immune cells to induce destruction of tissues (Radolf, 1996).

This balance of immune system stimulation and evasion is a key factor in the dynamic nature of clinical presentation of syphilis in adults as primary, secondary, latent, and tertiary syphilis (Radolf, 1996). Primary syphilis occurs with initial invasion of host tissues and presents as a painless ulcer (“chancre”) at the site of inoculation. Secondary syphilis is the multi-organ systemic disease with hematogenous spread of the infection and presents with vague symptoms such as malaise or lymphadenopathy, or more specific symptoms such as a generalized rash involving the palms and soles. Latent syphilis occurs after the secondary stage and is described as the relapsing and remitting of symptoms of secondary syphilis either early (within 1 year) or late (after 1 year), as *T. pallidum* bacteria live primarily in the host lymph nodes and spleen. About 30% of cases progress to tertiary syphilis, of which there are three subtypes: neurosyphilis, with involves the central nervous system, cardiovascular syphilis, which involves the endothelium of the aorta and coronary arteries, and benign gumma disease, which involves the skin and bones (Radolf, 1996; "Syphilis," 2021).

Transmission of this complex maternal infection to the fetus then allows for *T. pallidum* to invade fetal cells leading to a similar host inflammatory response resulting in destruction of tissues (Radolf, 1996). Transmission to the fetus can occur at any point in maternal syphilis infection (Rac, Stafford, & Eppes, 2020; "Syphilis," 2021) and at any point in pregnancy ("Syphilis," 2021; Wu et al., 2022), but the risk of fetal infection may change depending on maternal stage of disease. Risk of maternal transmission of infection is as high as 60-90% in primary or secondary syphilis, 40% in early latent syphilis, and drops to below 10% in late-latent syphilis (Wu et al., 2022). Treatment of maternal syphilis in pregnancy reduces the risk of fetal transmission, especially early in pregnancy ("Syphilis," 2021; Wu et al., 2022) but up to 16% of congenital syphilis infections have been shown to occur in women who did receive appropriate treatment in pregnancy (Stafford et al., 2024). Late treatment (<4 weeks prior to delivery) or lack of treatment of maternal syphilis in pregnancy was, however, shown to increase the risk of adverse fetal outcome with an odds ratio of 3.63 (Thean et al., 2022).

The clinical presentation of congenital syphilis in newborns is heterogenous. Of the liveborn infants with congenital syphilis in the United States between 2014 and 2018, 55.5% were asymptomatic at birth (Stafford et al., 2024). Symptomatic newborns have a wide variety of clinical presentations as well, including anemia, thrombocytopenia, pneumonia, hepatobiliary dysfunction, skin lesions, bone abnormalities, ophthalmologic abnormalities, splenomegaly, rhinitis, and CNS abnormalities (Aleem et al., 2022; Dai et al., 2022; David, Hcini, Mandelbrot, Sibiude, & Picone, 2022; Lago, Vaccari, & Fiori, 2013; "Syphilis," 2021). These findings are in addition to the possible resultant complications of fetal anomalies seen with syphilis infection, such as hydrops fetalis (Aleem et al., 2022; David et al., 2022; Stafford et al., 2024; "Syphilis," 2021; Woods, 2005). Additionally, infants born to mothers with pregnancy complicated by syphilis infection are at increased risk of being born small for gestational age or premature, which are risk factors for a multitude of other clinical problems and comorbidities (Dai et al., 2022; Stafford et al., 2024).

Congenital Syphilis (cont.)

Not only is detection of congenital syphilis difficult due to heterogeneity or lack of clinical symptoms, but confirming the diagnosis of congenital syphilis is also fraught with difficulty. Due to its fastidious nature, *T. pallidum* will not grow in culture, and the thin bacteria are not able to be seen with standard light microscopy when isolated from infected tissues or lesions (Radolf, 1996). While dark-field microscopy can be used to visualize *T. pallidum*, this is not typically done in clinical practice as the bacteria samples frequently dry out prior to being able to be visualized (Radolf, 1996), and dark-field microscopy is not readily available in most clinical settings (Dai et al., 2022). Diagnosis of syphilis infection, therefore, is reliant on serologic testing, using measures of host immune response as an indirect metric of disease (Radolf, 1996; "Syphilis," 2021). There are many serologic tests for syphilis infection, and most can be divided into either non-treponemal or treponemal tests. Non-treponemal tests measure host antibodies to the lipid antigens of *T. pallidum*, and generally parallel the extent of disease, reported as antibody titers. Treponemal tests measure host antibodies to the protein antigens of *T. pallidum*, and generally are reported as positive or negative, and usually remain positive for life even after an infection is treated and eradicated (Radolf, 1996; "Syphilis," 2021). As with all serologic testing, there is the risk for false positives with cross reactivity of antibodies to similar antigens ("Syphilis," 2021).

If congenital syphilis is undetected or untreated in the newborn period, consequences can be severe. While most infants with congenital syphilis are asymptomatic at birth (Dai et al., 2022; Rac et al., 2020; Stafford et al., 2024; "Syphilis," 2021; Woods, 2005), most infants will start to develop symptoms by 2-8 weeks of life if untreated (Rac et al., 2020). Later findings of congenital syphilis when left untreated include dental anomalies, sensorineural hearing loss, eye and vision problems, cosmetic manifestations, and neurodevelopmental delays, and are not reversible with treatment (Dai et al., 2022; Rac et al., 2020; "Syphilis," 2021; Woods, 2005).

While treatment of congenital syphilis early in the newborn period is often effective at eradicating the disease (Dai et al., 2022; "Syphilis," 2021), long -term neurodevelopmental effects of treated congenital syphilis are generally unknown (Stafford et al., 2024) and treatment may require increased hospital length of admission in the newborn period. Prevention of congenital syphilis is therefore paramount in addressing this disease and worsening public health crisis. An initiative in 2007 was launched by the World Health Organization to eliminate congenital syphilis worldwide, as this disease not only affects the United States, but also low-, middle-, and high- income countries across the globe (Thean et al., 2022). Goals set forth by this initiative focus on prevention, including greater than or equal to 95% of mothers being screened for syphilis infection in pregnancy and greater than or equal to 95% receiving complete treatment in pregnancy, in order to reduce the congenital syphilis rate to less than 50 per 100,000 live births worldwide (Thean et al., 2022).

Both screening and treatment of pregnant mothers for syphilis have significant barriers that have been studied, including access to prompt prenatal care, transportation difficulties to receive prenatal care and/or treatment, inadequate or absent treatment for partners, lack of knowledge regarding effects of infection to the fetus and newborn (Harville, Giarratano, Buekens, Lang, & Wagman, 2021; Park et al., 2022), stigma of testing and treatment, and prevalence of infection with concomitant substance abuse (Park et al., 2022). Addressing these barriers will not only help pregnant mothers, but also their newborns, and will allow for progress towards the goal of eradicating this preventable disease.

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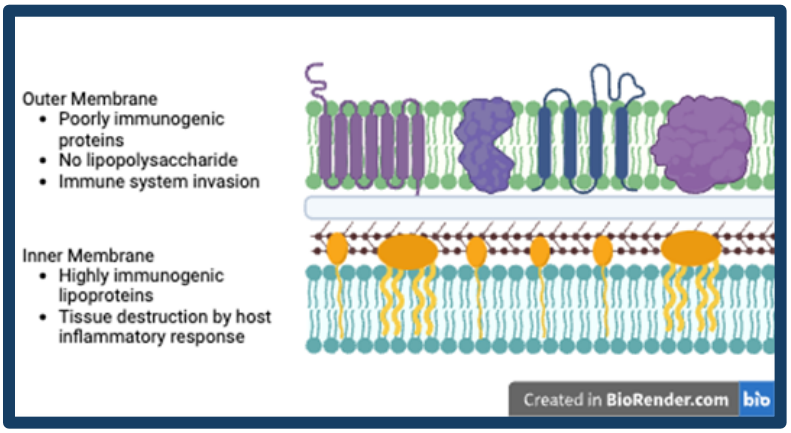
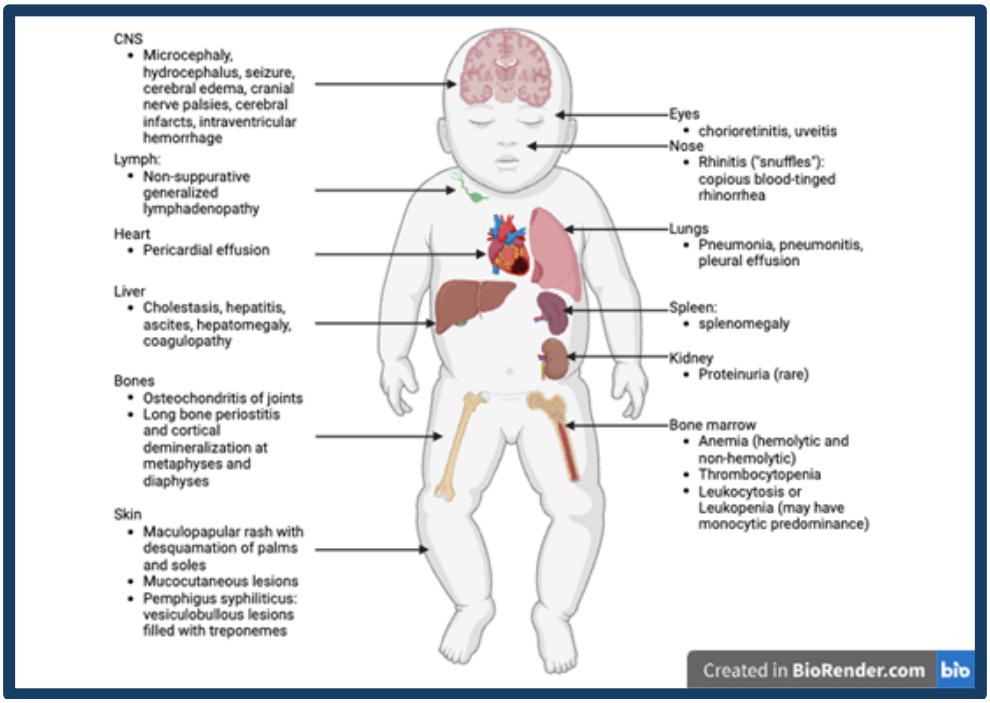
Megan Ottomeyer is an Assistant Professor of Pediatrics and Neonatologist at SSM Health Cardinal Glennon and other SSM Health St. Louis Special Care Nurseries. She is a St. Louis native who completed both her Pediatrics residency training as well as her Neonatal-Perinatal Medicine Fellowship with Saint Louis University at SSM Health Cardinal Glennon and currently serves as an Associate Program Director for the Saint Louis University Pediatrics Residency Program. In the community, she serves as the chair of the Young Professionals Board and as a member of the Board of Directors for Ranken Jordan Pediatric Bridge Hospital and is also involved in global health initiatives. Her special interests include medical education, children with medical complexity, neonatal end-of-life care, and preventable neonatal disease.





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