

Toxoplasmosis, Cytomegalovirus, Listeriosis, and Preconception Care

Danielle S. Ross · Jeffery L. Jones · Michael F. Lynch

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Toxoplasma gondii (*T. gondii*), cytomegalovirus (CMV), and *Listeria monocytogenes* (*L. monocytogenes*) can all negatively affect pregnancy outcomes. Preconception counseling about such effects can reduce the risks posed by these pathogens. Informing women of childbearing age about these pathogens and how to prevent their negative effects can help women make informed decisions about prevention. This brief summarizes some basic information about these infections and provides some web sites and articles for further information about how to prevent them within the context of preconception care.

Toxoplasmosis is a disease caused by *Toxoplasma gondii* (*T. gondii*), a protozoan parasite mainly transmitted to hu-

mans via three routes: a) ingestion of raw or undercooked contaminated meat; b) exposure to *T. gondii* oocysts (a form of the organism passed in cat feces), through cat litter or soil (e.g., from gardening or unwashed fruits or vegetables), or contaminated water; and c) congenital in which maternal infection is passed transplacentally via blood to the fetus [1]. Congenital infection leads to stillbirth and severe neurological illness in some instances, although the majority of infected newborns are asymptomatic at birth and some develop sequelae such as mental retardation, blindness, and epilepsy later in life [2]. Extrapolation from regional studies suggests that ~400–4,000 cases of congenital toxoplasmosis occur each year in the United States [2].

Adults with normal immune function who are infected with *T. gondii* are usually asymptomatic or have self-limited symptoms (e.g., fever, malaise, and lymphadenopathy) [1]. Once infected, these individuals usually develop an immune response against toxoplasmosis [3, 4]. A recent study based on the National Health and Nutrition Survey conducted from 1988–1994 (NHANES III) reported that, among women aged 15–44 years, seroprevalence of *T. gondii* antibodies was 15%, suggesting that ~85% of women of childbearing age are susceptible to *T. gondii* infection [5].

Three principal interventions are presently used to reduce morbidity and mortality from congenital toxoplasmosis: a) education about how to prevent infection (especially during pregnancy); b) prenatal and newborn screening to identify and treat congenital infection; and c) animal rearing and production methods designed to reduce *T. gondii* contamination of meat. Of the three, education about how to prevent infection is applicable to adolescents and women in the preconception period. Education programs during pregnancy have been associated with improved knowledge and behavior and a reduction in infection rates [6–9]. *Toxoplasma* infection can be prevented by one or more of the following:

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D. S. Ross (✉)
Centers for Disease Control & Prevention, National Center on Birth Defects and Developmental Disabilities,
1600 Clifton Road, NE, MailStop E-88, Atlanta, GA 30333
e-mail: dross3@cdc.gov

J. L. Jones
Centers for Disease Control & Prevention, National Center on Infectious Diseases,
1600 Clifton Road, NE, MailStop F-22, Atlanta, GA 30333
e-mail: JLLJones@cdc.gov

M. F. Lynch
Centers for Disease Control & Prevention, National Center on Infectious Diseases,
1600 Clifton Road, NE, MailStop A-38, Atlanta, GA 30333
e-mail: MLynch1@cdc.gov

a) cooking meat to a sufficient temperature to kill *Toxoplasma*; b) peeling or thoroughly washing fruits and vegetables before eating; c) cleaning cooking surfaces and utensils after they have contacted raw meat, poultry, or unwashed fruits or vegetables; d) pregnant women avoiding changing cat litter or using gloves, then washing hands thoroughly; and e) not feeding raw or undercooked meat to cats and keeping cats inside to prevent acquisition of *Toxoplasma* by eating infected prey [2].

Although prenatal and newborn screening programs have been evaluated, they are controversial because of the lack of proven efficacy of treatment, side effects of treatment, and potential complications of invasive procedures such as amniocentesis to evaluate fetal infection [10–23]. Animal rearing and production methods to reduce *T. gondii* contamination of meat are effective and have been associated with a reduction in the prevalence of *T. gondii* in important meat sources such as pork [24]; however the need for improvement in producers' knowledge and production practices is acknowledged [25]. Education about toxoplasmosis is an important component of preconception care that can be integrated with information about other diseases that affect women.

Human cytomegalovirus (CMV) is the largest DNA virus belonging to the herpesvirus family. Humans are the only reservoirs for the human herpesviruses, and they can transmit these agents through direct contact with infected blood, tissues, bodily fluids, feces, and fomites [26]. A pregnant woman infected with CMV can transmit this virus to her unborn fetus, which can cause damage to the central nervous system, hematopoietic system, kidneys, endocrine glands, gastrointestinal tract, lungs, and liver. Long-term sequelae include cerebral palsy, mental retardation, and hearing loss [26, 27]. The birth prevalence rate of congenital CMV infection varies between ~0.6–1.5% [28–30] in the United States, making it the most commonly transmitted virus in utero [26, 31] and a major cause of cerebral palsy, mental retardation, and hearing loss among children [27, 31].

CMV infects almost all humans at some point in their lives. Adults with normal immune function infected with CMV are usually asymptomatic or might experience mild flu-like symptoms, or even mononucleosis with symptoms such as malaise, persistent fever, myalgia, and cervical lymphadenopathy [26, 31]. Once a human is infected, the virus passes into a latent state [26]. Although the virus can be reactivated, it is usually kept under control, because adults with normal immune function usually retain lifelong immunity against CMV.

Primary CMV infection of women during pregnancy or periconceptionally results in transmission to the fetus transplacentally in ~30–40% of maternal infections [26, 32–34]. Preexisting maternal immunity strongly reduces the risk of transmission to the fetus [34]. However, approximately

10–15% of newborns with congenital CMV will be symptomatic and from ~6–25% of those born without symptoms will develop late sequelae [35].

The most common means for women to be infected with CMV is by exposure to toddlers who shed large amounts of the virus in their saliva and urine for many months following their first (usually asymptomatic) infection [26, 36–40]. Daycare providers and pregnant women who have a toddler of their own are at high risk for infection [41–46]. Sexual transmission, blood transfusion, and organ transplantation are other means by which CMV is transmitted [26]. It is important to counsel all women about safe sex practices.

Currently, there are no vaccines available for preventing CMV infection, although some promising advances have been made [47, 48]. It is, therefore, extremely important to provide women of childbearing age with information about how they can prevent CMV infection before conception. The most effective means for preventing CMV infection is handwashing [26, 49–53]. Education about careful hygiene and frequent handwashing, especially after contact with the saliva and urine of young children, and careful disposal of diapers, tissues, and other contaminated items can reduce the transmission of CMV. Avoiding sharing drinking glasses and eating utensils with young children can also prevent transmission. This is especially true for women who work in daycare settings and for those who are pregnant [26, 49–54].

As some studies suggest that CMV infection prior to conception can result in congenital CMV infection [26, 30, 55], counseling all women of childbearing age about how to prevent transmission preconceptionally could significantly reduce the incidence of congenital CMV infection.

Listeriosis is an invasive foodborne infection caused by the motile, gram-positive bacterium *Listeria monocytogenes* (*L. monocytogenes*). The disease affects primarily pregnant women, newborns, and adults with weakened immune systems [56]. Maternal infection during pregnancy is usually a self-limited, nonspecific acute febrile illness of the third trimester. In contrast to the maternal illness, fetal and neonatal infection is severe and frequently fatal. Infection in the fetus and newborn occurs by transplacental transmission or possibly from exposure to *L. monocytogenes* in the perinatal period. The effects of intrauterine infection on the fetus and neonate include preterm labor, amnionitis, spontaneous abortion, still birth, and early-onset of the neonatal sepsis syndrome, evident at birth or shortly thereafter. Late-onset neonatal disease is likely due to infection at or around the time of birth, and presents as meningitis at one to several weeks of age [57].

Listeriosis is a rare disease; the incidence rate in 10 states participating in the Foodborne Diseases Active Surveillance Network (FoodNet) was 2.7 cases per 1,000,000 population

in the year 2004 [58]. However, the incidence rate in susceptible subgroups is much higher. The rate among neonates younger than 28 days of age in FoodNet sites was 52.8 per 100,000 population in the year 2000 (CDC unpublished data). More importantly, listeriosis has a very high case fatality rate (20–30% in neonates) and is responsible for an estimated 500 deaths each year in the United States [59].

The food items implicated in outbreaks of listeriosis include ready-to-eat meats, such as turkey delicatessen meat [60], meat paté [61], pork tongue in jelly [62], hot dogs [63], and dairy products made from unpasteurized milk, in particular fresh soft cheeses [64].

Primary prevention for listeriosis focuses on improvements in food processing and on consumer education. Substantial efforts by the food industry and food regulatory agencies have been directed toward reducing the likelihood that high risk foods will be contaminated with *L. monocytogenes* [65]. Despite this, pregnant women, immunocompromised persons, and the elderly should be advised to avoid paté, fresh soft cheeses made from unpasteurized milk and to cook ready-to-eat foods such as hotdogs, delicatessen meats, and left over foods until steaming [66]. Information regarding these foods at high risk of contamination with *Listeria* can be incorporated into preconception care dietary recommendations.

For more information

CDC web sites

Toxoplasmosis: <http://www.cdc.gov/ncidod/dpd/parasites/toxoplasmosis/default.htm>

CMV: <http://www.cdc.gov/cmvmv>

Listeria: http://www.cdc.gov/ncidod/dbmd/diseaseinfo/listeriosis_g.htm

Publications for practitioners

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