

A vertically transmitted infection is an infection caused by pathogens

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Abstract

Transmitted infection is an infection caused by pathogens (such as bacteria and viruses) that use mother-to-child transmission, that is, transmission directly from the mother to an embryo, fetus, or baby during pregnancy or childbirth. It can occur when the mother has a pre-existing disease or becomes infected during pregnancy. Nutritional deficiencies may exacerbate the risks of perinatal infections. Hepatitis B may also be classified as a vertically transmitted infection. The hepatitis B virus is large and does not cross the placenta. Hence, it cannot infect the fetus unless breaks in the maternal-fetal barrier have occurred, but such breaks can occur in bleeding during childbirth or amniocentesis. The TORCH complex was originally considered to consist of the four conditions mentioned above, with the "TO" referring to Toxoplasma. The four-term form is still used in many modern references, and the capitalization "ToRCH" is sometimes used in these contexts. The acronym has also been listed as TORCHES, for TOxoplasmosis, Rubella, Cytomegalovirus, HErpes simplex, and Syphilis. The signs and symptoms of a vertically transmitted infection depend on the individual pathogen. In the mother, it may cause subtle signs such as an influenza-like illness, or possibly no symptoms at all. In such cases, the effects may be seen first at birth. Symptoms of a vertically transmitted infection may include fever and flu-like symptoms. The newborn is often small for gestational age. A petechial rash on the skin may be present, with small reddish or purplish spots due to bleeding from capillaries under the skin. An enlarged liver and spleen (hepatosplenomegaly) is common, as is jaundice. However, jaundice is less common in hepatitis B because a newborn's immune system is not developed well enough to mount a response against liver cells, as would normally be the cause of jaundice in an older child or adult. Hearing impairment, eye problems, mental retardation, autism, and death can be caused by vertically transmitted infections.

Virulence versus symbiosis

In the spectrum of optimal virulence, vertical transmission tends to evolve benign symbiosis, so is a critical concept for evolutionary medicine. Because a pathogen's ability

to pass from mother to child depends significantly on the hosts' ability to reproduce, pathogens' transmissibility tends to be inversely related to their virulence. In other words, as pathogens become more harmful to, and thus decrease the reproduction rate of, their host organism, they are less likely to be passed on to the hosts' offspring, since they will have fewer offspring. Although HIV is sometimes transmitted through perinatal transmission, its virulence can be accounted for because its primary mode of transmission is not vertical. Moreover, medicine has further decreased the frequency of vertical transmission of HIV. The incidence of perinatal HIV cases in the United States has declined as a result of the implementation of recommendations on HIV counselling and voluntary testing practices and the use of zidovudine therapy by providers to reduce perinatal HIV transmission. The price paid in the evolution of symbiosis is, however, great: for many generations, almost all cases of vertical transmission continue to be pathological—in particular if any other routes of transmission exist. Many generations of random mutation and selection are needed to evolve symbiosis. During this time, the vast majority of vertical transmission cases exhibit the initial virulence. In dual inheritance theory, vertical transmission refers to the passing of cultural traits from parents to children. Congenital cytomegalovirus (CMV) infection refers to a condition where cytomegalovirus is transmitted in the prenatal period. CMV is a member of the virus family herpesviridae and is the most common intra-uterine infection.

For infants who are infected by their mothers before birth, two potential adverse scenarios exist:

Generalized infection may occur in the infant, and can cause complications such as low birth weight, microcephaly, seizures, petechial rash similar to the "blueberry muffin" rash of congenital rubella syndrome, and moderate hepatosplenomegaly (with jaundice). Though severe cases can be fatal, with supportive treatment most infants with CMV disease will survive. However, from 80% to 90% will have complications within the first few years of life that may include hearing loss, vision impairment, and varying degrees of learning disability. Another 5% to 10% of infants who are infected but without symptoms at birth will subsequently have varying degrees of hearing and mental or coordination problems. CMV is the most common cause of non-genetic sensorineural hearing loss in children. The onset of hearing loss can occur at any point during childhood, although commonly within the first decade. It is pro-

gressive and can affect both ears. The earlier the mother contracts the virus during pregnancy the more severe the effects are on the fetus, similarly the incidence of SNHL is dependent on which trimester of pregnancy CMV is contracted. The virus accounts for 20% of sensorineural hearing loss in children. These risks appear to be almost exclusively associated with women who previously have not been infected with CMV and who are having their first infection with the virus during pregnancy. There appears to be little risk of CMV-related complications for women who have been infected at least 6 months prior to conception. For this group, which makes up 50% to 80% of the women of child-bearing age, the rate of newborn CMV infection is 1%, and these infants appear to have no significant illness or abnormalities. The virus can also be transmitted to the infant at delivery from contact with genital secretions or later in infancy through breast milk. However, these infections usually result in little or no clinical illness in the infant. CMV can also be transferred through blood transfusions and close contact with large groups of children. To summarise, during a pregnancy when a woman who has never had CMV infection becomes infected with CMV, there is a risk that after birth the infant may have CMV-related complications, the most common of which are associated with hearing loss, visual impairment, or diminished mental and motor capabilities. On the other hand, healthy infants and children who acquire CMV after birth have few, if any, symptoms or complications.