

circumstances. Since the beginning of the HIV epidemic, there have been rare instances where transmission of infection from a health care worker to patients seemed highly probable. Despite these small number of documented cases, the risk of HIV transmission involving health care workers (infected or not) to patients is extremely low in developed countries—in fact, too low to be measured accurately. In this regard, several epidemiologic studies have been performed tracing thousands of patients of HIV-infected dentists, physicians, surgeons, obstetricians, and gynecologists, and no other cases of HIV transmission that could be linked to the health care providers were identified.

Breaches in infection control and the reuse of contaminated syringes, failure to properly sterilize surgical instruments, and/or hemodialysis equipment have also resulted rarely in the transmission of HIV from patient to patient in hospitals, nursing homes, and outpatient settings. Finally, these very rare occurrences of transmission of HIV as well as HBV and HCV to and from health care workers in the workplace underscore the importance of the use of universal precautions when caring for all patients (see below and [Chap. 168](#)).

MOTHER-TO-CHILD TRANSMISSION OF HIV

HIV infection can be transmitted from an infected mother to her fetus during pregnancy, during delivery, or by breast-feeding. This remains an important form of transmission of HIV infection in certain developing countries, where the proportion of infected women to infected men is ~1:1. Virologic analyses of aborted fetuses indicate that HIV can be transmitted to the fetus during the first or second trimesters of pregnancy. However, maternal transmission to the fetus occurs most commonly in the perinatal period. Two studies performed in Rwanda and the Democratic Republic of Congo (then called Zaire) indicated that among all mother-to-child transmissions of HIV, the relative proportions were 23–30% before birth, 50–65% during birth, and 12–20% via breast-feeding.

In the absence of prophylactic antiretroviral therapy to the mother during pregnancy, labor, and delivery, and to the fetus following birth, the probability of transmission of HIV from mother to infant/fetus ranges from 15% to 25% in industrialized countries and from 25% to 35% in developing countries. These differences may relate to the adequacy of prenatal care as well as to the stage of HIV disease and the general health of the mother during pregnancy. Higher rates of transmission have been reported to be associated with many factors—the best documented of which is the presence of high maternal levels of plasma viremia, with the risk increasing linearly with the level of maternal plasma viremia. It is very unlikely that mother-to-child transmission will occur if the mother's level of plasma viremia is <1000 copies of HIV RNA/mL of blood and extremely unlikely if the level is undetectable (i.e., <50 copies/mL). However, there may not be a lower “threshold” below which transmission never occurs, since certain studies have reported rare transmission by women with viral RNA levels <50 copies/mL. Increased mother-to-child transmission is also correlated with closer human leukocyte antigen (HLA) match between mother and child. A prolonged interval between membrane rupture and delivery is another well-documented risk factor for transmission. Other conditions that are potential risk factors, but that have not been consistently demonstrated, are the presence of chorioamnionitis at delivery; STIs during pregnancy; illicit drug use during pregnancy; cigarette smoking; preterm delivery; and obstetric procedures such as amniocentesis, amniocentesis, fetal scalp electrodes, and episiotomy. In a seminal study conducted in the United States and France in the 1990s, zidovudine treatment of HIV-infected pregnant women from the beginning of the second trimester through delivery and of the infant for 6 weeks following birth dramatically decreased the rate of intrapartum and perinatal transmission of HIV infection from 22.6% in the untreated group to <5%. Today, the rate of mother-to-child transmission has fallen to 1% or less in pregnant women who are receiving combination antiretroviral therapy (cART) for their HIV infection. Such treatment, combined with cesarean section delivery, has rendered mother-to-child transmission of HIV an unusual event in the United States and other developed nations. In this regard, both the United States Public Health Service and the World Health

Organization guidelines recommend that all pregnant HIV-infected women should receive cART for the health of the mother and to prevent perinatal transmission regardless of plasma HIV RNA copy number or CD4+ T cell counts.


Breast-feeding is an important modality of transmission of HIV infection in developing countries, particularly where mothers continue to breast-feed for prolonged periods. The risk factors for mother-to-child transmission of HIV via breast-feeding are not fully understood; factors that increase the likelihood of transmission include detectable levels of HIV in breast milk, the presence of mastitis, low maternal CD4+ T cell counts, and maternal vitamin A deficiency. The risk of HIV infection via breast-feeding is highest in the early months of breast-feeding. In addition, exclusive breast-feeding has been reported to carry a lower risk of HIV transmission than mixed feeding. In developed countries, breast feeding of babies by an HIV-infected mother is contraindicated since alternative forms of adequate nutrition, i.e., formulas, are readily available. In developing countries, where breast-feeding may be essential for the overall health of the infant, the continuation of cART in the infected mother during the period of breastfeeding markedly diminishes the risk of transmission of HIV to the infant. In fact, once cART has been initiated in a pregnant woman, many experts recommend that therapy be continued for life.

TRANSMISSION OF HIV BY OTHER BODY FLUIDS

Although HIV can be isolated typically in low titers from saliva of a small proportion of infected individuals, there is no convincing evidence that saliva can transmit HIV infection, either through kissing or through other exposures, such as occupationally to health care workers. Saliva contains endogenous antiviral factors; among these factors, HIV-specific immunoglobulins of IgA, IgG, and IgM isotypes are detected readily in salivary secretions of infected individuals. It has been suggested that large glycoproteins such as mucins and thrombospondin 1 sequester HIV into aggregates for clearance by the host. In addition, a number of soluble salivary factors inhibit HIV to various degrees in vitro, probably by targeting host cell receptors rather than the virus itself. Perhaps the best studied of these, secretory leukocyte protease inhibitor (SLPI), blocks HIV infection in several cell culture systems, and it is found in saliva at levels that approximate those required for inhibition of HIV in vitro. In this regard, higher salivary levels of SLPI in breast-fed infants were associated with a decreased risk of HIV transmission through breast milk. It has also been suggested that submandibular saliva reduces HIV infectivity by stripping gp120 from the surface of virions, and that saliva-mediated disruption and lysis of HIV-infected cells occurs because of the hypotonicity of oral secretions. There have been outlier cases of suspected transmission by saliva, but these have probably been blood-to-blood transmissions. Transmission of HIV by a human bite can occur but is a rare event. Although virus can be identified, if not isolated, from virtually any body fluid, there is no evidence that HIV transmission can occur as a result of exposure to tears, sweat, or urine. However, there have been isolated cases of transmission of HIV infection by body fluids that may or may not have been contaminated with blood. Most of these situations occurred in the setting of a close relative providing intensive nursing care for an HIV-infected person without observing universal precautions, underscoring the importance of adhering to such precautions in the handling of body fluids and wastes from HIV-infected individuals.

EPIDEMIOLOGY

HIV INFECTION AND AIDS WORLDWIDE

 HIV infection/AIDS is a global pandemic, with cases reported from virtually every country. At the end of 2013, an estimated 35.0 million individuals were living with HIV infection, according to the Joint United Nations Programme on HIV/AIDS (UNAIDS). An estimated 95% of people living with HIV/AIDS reside in low- and middle-income countries; ~50% are female, and 3.2 million are children <15 years. The distribution of these cases is illustrated in [Fig. 226-8](#). The estimated number of people living with HIV—i.e.,