

# Paternal HIV infection and transfer of HIV from mother to fetus

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Studies on vertical transmission of HIV have not considered the possible influence of paternal HIV infection. Fetal infection could result from integration of HIV in the sperm, but evidence for this is still controversial.<sup>1</sup> Integration of HIV may occur in only a few sperm or reduce their fertility, which would make direct transmission from the father rare. No birth of an HIV positive infant to an uninfected mother has been reported. Furthermore, the insemination of HIV negative women with the processed semen of their HIV positive partners has led to non-infected babies.<sup>2</sup>

Paternal HIV infection could influence vertical transmission by other mechanisms. Infected men shed cell free HIV and cell associated HIV in their semen.<sup>3</sup> Unprotected intercourse during pregnancy would result in an unknown quantity of infected semen being repeatedly deposited inside the vagina, putting babies who are delivered by the vaginal route at increased risk of infection. We investigated whether paternal HIV increases the risk of vertical transmission.

## Subjects, methods, and results

Children born since 1986 to women known to be HIV positive were enrolled in a collaborative study and followed up from birth. We reviewed 201 mothers and their 205 infants (four had twins), when the children were over 18 months old and the paternal HIV status was known. Forty one children were infected and 164 (including all twins) were free of infection at 18 months, which is the limit set for elimination of maternal antibodies by the Centers for Disease Control. We did not know the fathers' mode of infection, stage of immunodeficiency, or antiretroviral treatment. Most were probably infected through injection of drugs as this is how 67% of HIV positive men contract HIV infection in Italy (Ministry of Health notice, 1993).

Of the women, 147 were infected through injecting drugs and 54 through sexual contact. One hundred and seventy women had stage II and III of disease and 31 had stage IV disease, according to Centers for Disease Control criteria. A total of 135 women had an HIV positive partner, 20 (15%) of whom had stage IV disease; 17% (11/66) of women with a non-infected partner had stage IV disease. None of the women had taken zidovudine during pregnancy. Delivery was by caesarean section in 40 (30%) of the women infected by injecting drugs and 12 (22%) of the sexually infected women. Data were analysed by the  $\chi^2$  test and relative risks were also calculated.

The table shows the rate of transmission from mother to fetus according to paternal HIV infection and mode of delivery. Paternal HIV infection had no significant effect on rate of fetal infection (odds ratio 1.15 (95% confidence interval 0.52 to 2.67); relative risk 1.05 (0.58 to 1.9)) when vaginal and caesarean birth were considered jointly.

The mode of delivery significantly affected the rate of infection (odds ratio 3.38 (1.22 to 11.70),  $p < 0.021$  with continuity correction) when all babies were considered together, irrespective of paternal HIV infection. The relative risk of HIV infection for babies delivered vaginally compared with those delivered by caesarean section was 2.78 (1.2 to 6.7). The corresponding relative risk was 2.62 (0.97 to 7.1) for babies with

an HIV positive father and 3.53 (0.50 to 25) for those with an infected father. When mothers with stage II and III disease were compared with mothers in stage IV no difference was found in the rate of fetal infection according to paternal HIV status.

Number (percentage) of children with HIV infection at 18 months according to paternal HIV infection and mode of delivery

Paternal HIV status	All births	Vaginal delivery	Caesarean delivery	p Value
Positive (n=135)	28 (21)	24/94 (26)	4/41 (10)	<0.06
Negative (n=66)	13 (20)	12/51 (24)	1/15 (7)	0.27
p Value	<1.0	<0.9	<1.0	

## Comment

In this study the couples' HIV status was biased by the route of maternal infection. Fifty seven (39%) mothers who were drug misusers had an HIV negative partner compared with eight (15%) of those infected through sexual contact. This suggests that couples in which only one person is infected with HIV may not be deterred from attempting to become parents.

Paternal HIV infection did not bias the rate of transmission of vertical HIV, indicating that even if fetal infection can result from HIV infected sperm, this is rare. Although the possibility remains that HIV may integrate with the sperm,<sup>1</sup> our data suggest that most sperm do not become infected or that infected sperm become infertile.

Repeated exposure of the cervix and vagina to HIV infected semen during gestation or close to delivery could increase the risk of transmission to infants born vaginally. We found no such increase, suggesting couples do not have unprotected intercourse after the woman became pregnant or close to the time of delivery. As we could not consider some factors which may affect the presence of HIV in semen, such as stage of immunodeficiency, antiretroviral drugs, and genital infections<sup>3</sup> further investigation is needed.

The rate of infection in infants born by caesarean section was significantly lower than that of children born vaginally, irrespective of the father's HIV status. This agrees with the results of larger studies.<sup>4,5</sup>

Many HIV positive women ask if their babies will be more likely to become infected when their partner is HIV positive. Our data suggest that the risk is not increased.

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