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Pre-exposure prophylaxis for infants exposed to HIV through breast feeding

Philippe Van de Perre and colleagues say current strategies for preventing transmission of HIV infection from mother to child are inadequate and call for infants to be given pre-exposure prophylaxis.

The AIDS 2016 conference, held in July in Durban, South Africa, lauded pre-exposure prophylaxis (PrEP) as the way forward for substantially reducing the rate of new HIV infections worldwide. PrEP is defined as the continuous or intermittent use of an antiretroviral drug or drug combination to prevent HIV infection in people exposed to the virus. The underlying pathophysiological rationale is that impregnating uninfected cells and tissues with an antiviral drug could prevent infection by both cell-free and cell-associated HIV (cell-to-cell transfer). PrEP’s tolerance and efficacy have been demonstrated in well-designed clinical trials in men who have sex with men (MSM).

In the Ipergay trial, 86% of HIV infections were averted in highly exposed groups such as transgender women, injecting drug users, serodiscordant heterosexual couples, and commercial sex workers.

HIV exposed children: lost in translation

Uninfected pregnant or breastfeeding women in high incidence areas have also been suggested as a potential target population for PrEP, but infants exposed to HIV through breast feeding have not been mentioned. Numerous public declarations and petitions have produced a strong advocacy for extension of the PrEP principle to all high risk populations exposed to HIV, considering access to PrEP as part of human rights. Recently, the World Health Organization recommended offering PrEP to any population in which the expected incidence of HIV infection is above 3 per 100 person-years. So why are breastfed infants born to HIV infected women, a population that often has an overall HIV acquisition rate above 3/100 person-years, not receiving this clearly beneficial preventive health measure?

Current strategy not good enough

Since June 2013, the WHO has recommended universal lifelong antiretroviral therapy (ART)—known as “option B+”—for all pregnant and breastfeeding women infected with HIV-1, with the objective of eliminating mother-to-child transmission (defined by WHO as an overall rate of transmission lower than 5%). The B+ strategy also recommends that their babies receive nevirapine for six weeks to mitigate the risks of transmission during delivery. But infants who are breast fed continue to be exposed to a substantial risk of infection beyond the six week prophylaxis period.

The B+ strategy has been rolled out in most programmes to prevent mother-to-child transmission worldwide without any additional protection for breastfed infants. Although these programmes have been shown to increase the number of pregnant and breastfeeding women who receive ART, their success in prevention of infection in infants is less clear. According to UNAIDS estimates, improvement in services to prevent mother-to-child HIV transmission since 2010 has reduced the annual number of new infections among children globally by 56%.

However, the few available programmatic data on long term residual HIV transmission rates suggest that this is mainly accounted for by reduced in utero and intrapartum HIV transmission rather than in postnatal transmission through breast feeding. Also, there is considerable variation across countries and continents, with many countries, mainly in Africa.
Reasons for continued transmission

Most of the residual transmission is attributable to exposure through breast feeding. A recent study assessed maternal antiretroviral drug plasma concentrations in Malawi and Maternal and child health coordinators in breast feeding communities from Malawi and Swaziland. The study found that the average maternal plasma concentration was 2000 copies/ml ranging from 1000 copies/ml to 8000 copies/ml. The study also found that the maternal plasma concentration was higher in those who were on ART than in those who were not on ART. The study concluded that the higher maternal plasma concentration was associated with a lower residual transmission rate. The authors recommended that ART should be continued during breast feeding to reduce the residual transmission rate.

Infant prophylaxis has been used before

Administration of a daily antiretroviral drug to an uninfected but exposed breastfed infant meets the definition of PrEP: the prophylaxis is administered before exposure (ideally from birth) to an uninfected infant whose exposure to HIV is intermittent (during breast feeding) and persistent. Ironically, infants born to HIV infected women were the first to participate in ARV prophylaxis trials. They have probably contributed the highest number of participants in such studies worldwide. Indeed, prophylaxis with oral zidovudine was integrated in the first prophylactic protocol (ACTG 076) reported in 1994. Thereafter, numerous trials have included infant PrEP to prevent mother-to-child transmission, in combination or even as a sole preventive regimen. The most recent of these, the ANRS 12174 trial, showed that infant prophylaxis with either lamivudine (3TC) or boosted lopinavir (LPV/r) daily throughout breastfeeding for up to 12 months among infants of HIV infected women who did not qualify for ART for their own health was well tolerated and reduced the risk of postnatal transmission at 1 year of age to 0.5% (per protocol) or 1.4% (intention to treat). Adherence to infant PrEP in the trial was particularly high (over 90%).

Pharmacological data suggest that plasma drug levels lower than the therapeutic threshold are sufficient to protect infants. In addition, pharmacokinetic studies in infants breastfed by mothers taking ART show that their antiretroviral drug plasma levels are largely below 5% of the therapeutic level. This suggests that infant PrEP could be combined with maternal ART without a risk of overdosing or cumulative adverse effects.

In the near future, injectable long acting antiretroviral drugs such as rilpivirine or cabotegravir may become available. This would enable PrEP to be started from birth with only a few additional administrations to cover the duration of breastfeeding. The estimated cost of daily administration lamivudine paediatric suspension in a breastfed infant is less than €15 (£12; €14) a year. Cost effectiveness studies of infant PrEP have not been done, but the low cost of the infant PrEP regimen suggests that the expected benefit would justify the expense of adding it to maternal ART. Indeed, even if only one HIV infection was averted out of 100 exposed infants, the cost per averted infection would be minimal ($1500).

When should infant PrEP be recommended?

Infant PrEP should certainly be advised when the mother’s HIV infection is untreated or if she has a detectable viral load despite ART. Such situations can occur when the mother does not want or is unable to take ART or is at high risk of poor drug adherence. The determinants of maternal adherence to ART probably differ from those for adherence to infant PrEP. Unpublished data collected during the ANRS 12174 trial suggest that most pregnant or lactating mothers prefer to administer a prophylactic antiretroviral drug to their exposed infant than to adhere to their own ART. However, this targeted approach may be seen as complex and hampered by programmatic problems in some settings. A simpler alternative would be to protect all HIV exposed infants with PrEP during the breastfeeding period, on the basis that the PrEP drugs are safe and that optimal maternal adherence to ART in the perinatal period cannot be assumed. Of course, treatment of the mother should remain a priority.

Conclusion

Mother-to-child HIV transmission among breastfed infants is not unlike HIV transmission associated with discordant couples, with the mother and child having frequent contact that exposes the infant to HIV, even if the mother is provided with a
suppressing ART regimen. Given the evidence that infant PrEP is effective, there is a moral imperative to correct the policy inequity that exists between HIV exposed adults and children. Scaling up existing interventions and extended access to PrEP to those in need are the most cost effective ways to stem new HIV infections.22 Expanding global prevention guidelines to include infant PrEP for infants exposed to HIV by breastfeeding could be a major breakthrough as a public health approach to eliminate mother-to-child transmission.

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Key messages

WHO recommends pre-exposure prophylaxis for any group with an expected incidence of HIV infection above 3/100 person-years
Current strategies to prevent mother-to-child transmission of HIV cover only the first six weeks
Many infections of breastfed infants occur after this period
Adding infant PrEP to maternal ART is cheap and does not expose infants to unsafe doses
Routine infant PrEP has the potential to be a breakthrough in elimination of mother-to-child transmission