

Breast feeding and HIV transmission:

Current state of the evidence

Robert Pratt BA, MSc, RN, RNT, FRCN, Professor of Nursing, Richard Wells Research Centre, Thames Valley University London
Carol Pellowe BA (Hons), MA (Ed), RN, RNT, Principal Lecturer (Research), Richard Wells Research Centre, Thames Valley University London

Women now account for at least half of the total global number of adults living with HIV/AIDS. Most of them are of childbearing age and, as more and more women have become infected with HIV, an increasing number of their newborn infants are also at risk of becoming infected from them before, during or soon after childbirth. This article looks at the feasibility of preventing mother-to-child transmission of HIV, particularly in the industrially developing regions of the world.

Keywords: breast feeding; breast milk; human immunodeficiency virus; vertical transmission; prevention

Introduction

By the beginning of 2003, more than 3.2 million children under the age of 15 years throughout the world were living with HIV/AIDS (Figure 1). During the previous year, more than 800,000 children were newly infected with HIV (more than 2,250 every day) and at least 1,700 children died every day (Figures 2 and 3) (UNAIDS/WHO, 2002).



Figure 1. Children (<15 years) estimated to be living with HIV/AIDS as of end 2002. Courtesy of UNAIDS (2002).

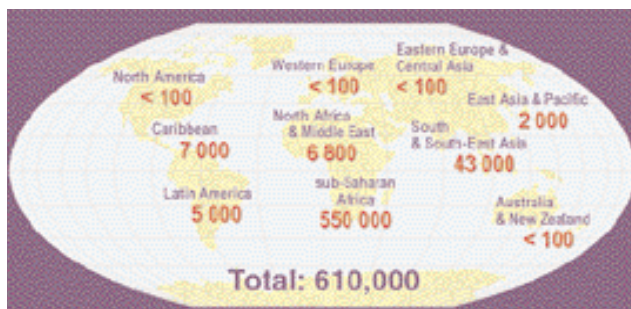


Figure 2. Estimated deaths in children (<15 years) from HIV/AIDS during 2002. Courtesy of UNAIDS (2002).

The risk of becoming infected with HIV depends mainly on where the child is born. Most HIV-infected children (90%) are born in impoverished countries in the industrially developing world, mainly sub-Saharan Africa. However, as national HIV epidemics escalate in South and Southeast Asia, the number of HIV-infected infants born in these densely populated regions



Figure 3. Estimated number of children (<15 years) newly infected with HIV during 2002. Courtesy of UNAIDS (2002).

may soon dwarf the current tragedy being experienced today in southern Africa. In addition, the force of national epidemics of HIV infection in resource-poor countries in eastern Europe continue to build, setting the stage for increased risk to children (UNAIDS/WHO, 2002).

In contrast in the richer nations of the industrially developed world, comprehensive prevention strategies have dramatically decreased the number of HIV-infected newborn children to the point where it is becoming uncommon for children to become infected from their mothers.

Key points

Pratt, R. and Pellowe, C. (2003) Breast feeding and HIV transmission: Current state of the evidence. *Journal of Neonatal Nursing* 9(4): 133-39.

1. Over 800 000 children throughout the world acquire HIV infection from their mothers every year.
2. Those children living in the impoverished countries of the developing world are at greatest risk of infection.
3. There is conclusive evidence that HIV is transmitted by breast milk.
4. Modification of infant feeding practices, where appropriate, can significantly reduce the risk of mother-to-child HIV transmission.
5. For most newborn children in the developing world, breast feeding should continue to be recommended and promoted.

Maternal Factors	Notes
Disease stage of mother	Primary HIV infection and symptomatic HIV disease, both associated with high levels of HIV in the plasma (viral load) and low numbers of CD4 ⁺ T-lymphocytes, are associated with an increased risk for MTCT (Garcia et al, 1999; Anderson, 2001).
Plasma and genital tract viral load	High plasma and genital tract viral load is associated with an increased risk for MTCT (Garcia et al, 1999; Anderson, 2001; Fang et al, 1998).
CD4 ⁺ T-lymphocyte number	Low CD4 ⁺ T-lymphocyte count or decreased CD4 ⁺ :CD8 ⁺ ratio are both associated with an increased risk for MTCT (Anderson, 2001).
Antiretroviral treatment and prophylaxis	The use of antiretroviral drugs (zidovudine, lamivudine, nevirapine) in treatment regimens for the mother or as chemoprophylaxis for the neonate have been shown to significantly decrease the risk for MTCT (Anderson, 2001).
Vitamin A deficiency	Vitamin A deficiency is associated with an increased risk of pre-term delivery which increases the risk of MTCT (Coutsoudis et al, 1999a). Severe deficiency may also adversely affect the integrity of the vaginal mucosa and increase HIV vaginal shedding (John et al, 1997).
Sexual behaviour	A history of unprotected penetrative sexual intercourse with several partners has been associated with an increased risk for MTCT (Anderson, 2001; Bulterys et al, 1997).
Sexually transmitted infections	The presence of other sexually transmitted infections increases plasma viraemia (viral load). These infections also increase the number of genital tract inflammatory cells which stimulates HIV shedding, increasing the risk for MTCT (Anderson, 2001; Plummer, 1998).
Substance use	The use of illicit drugs during pregnancy increases the risk for MTCT (Anderson, 2001; Rodriguez et al, 1996; Lyman, 1993).
Obstetric Factors	Notes
Gestational age	Pre-term delivery has been shown to increase the risk for MTCT. (Anderson, 2001; Kuhn et al, 1997; Kuhn et al, 1999)
Duration of membrane rupture	The risk of MTCT increases linearly with increasing duration of ruptured membranes with a 2% increase in risk for each hour increment. Women with late symptomatic HIV disease (AIDS) have a 31% probability of MTCT after 24 hours of ruptured membranes. (Read, 2000)
Placental disruption-abruption, chorioamnionitis	Chorioamnionitis increases the risk of MTCT (Goldenbert et al, 1998) and placental abruption causing disruption of the placental-fetal barrier, may increase fetal exposure to maternal blood and increases the risk of MTCT (Anderson, 2001).
Invasive fetal monitoring	Use of fetal scalp electrodes, fetal scalp sampling, amniocentesis and amniocentesis increases the risk for MTCT (Maiques et al, 1999; Mandelbrot et al, 1996).
Episiotomy, forceps	Use of episiotomy, vacuum extraction or forceps may increase the risk for MTCT by exposing the fetus to maternal blood and genital secretions. However, careful use may shorten duration of labour or ruptured membranes with vaginal delivery and this may decrease risk of MTCT (Anderson, 2001). External version should be avoided because of the increased risk for maternal-fetal bleeding.
Vaginal vs. caesarean delivery	Caesarean delivery performed before the onset of labour and rupture of membranes can reduce the risk of MTCT by 55-88% (EMDC, 1999; IPHIVG, 1999).
Postnatal factors	Notes
Breast feeding	The risk of MTCT from breast feeding is greatest in early infancy (before 6 months of age) and persists as long as breast feeding continues (Miotti et al, 1999; Nduati et al, 2000; John et al, 2001). The longer the duration of breast feeding, the greater the risk of MTCT (Leroy et al, 1998; Embree et al, 2000; Read et al, 2002).
Blood transfusions	Mothers may initially become infected with HIV as a result of an unscreened blood transfusion during the peripartum period. During maternal primary HIV infection, when the plasma viral load is high, there is a significantly increased risk for MTCT from breast feeding.

Table 1. Factors that influence the risk for MTCT of HIV

Behavioural Interventions	<ul style="list-style-type: none"> • Prevent further sexually transmitted infections during pregnancy by reducing the number of sexual partners • Reduce the frequency of unprotected sexual intercourse • Discontinue the use of illicit drugs during pregnancy
Therapeutic interventions	<ul style="list-style-type: none"> • Commence mother on antiretroviral therapy or • Provide chemoprophylaxis for infant • Effectively treat any co-existing sexually transmitted infections • If vitamin A deficient, provide vitamin supplementation
Obstetric interventions	<ul style="list-style-type: none"> • Avoid invasive tests or monitoring during the antenatal and intrapartum period • Consider the benefits of caesarean delivery
Modification of infant feeding practice	<ul style="list-style-type: none"> • Refrain from breast feeding or • Exclusively breast feed and • Cease breast feeding as early as possible • Pasteurise expressed breast milk
Blood transfusions	<ul style="list-style-type: none"> • Use only blood and blood components that have been screened for HIV infection

Table 2. Methods for preventing MTCT.

Mother-to-child transmission

Mother-to-child transmission (MTCT), also known as vertical or perinatal transmission, can occur during pregnancy (*in utero*), during birth (intrapartum) when the newborn infant comes into contact with infected maternal birth fluids during the birth process, and shortly after birth (postpartum) or during the early months of life while being breast fed. Most children (75%) become infected during the peripartum period, i.e. during or shortly after delivery (Microchnick et al, 1998).

Risk factors

Women are potentially at risk of initial infection during sexual intercourse with HIV-infected men, from sharing HIV-contaminated injecting equipment, or following treatment with transfusions of unscreened whole human blood or blood components.

Once infected, several maternal, obstetric and postnatal factors can increase the likelihood of mothers transmitting HIV infection to their child before, during and immediately following birth. Some of the most important risk factors are described in Table 1 and further discussed elsewhere (Pratt, 2003). Understanding these risks has led to the development of effective risk-reduction strategies.

Risk reduction strategies

Among the several options that have been described for preventing MTCT (Table 2) (Pratt, 1999; 2003) the following three are the most important:

- antiretroviral chemoprophylaxis
- elective caesarean section delivery
- mothers refraining from breast feeding

In western Europe, where these interventions are available, the rate of MTCT has fallen from an average of 15% to 2% or less by 1999 (ECS, 2001). This pattern is replicated in other industrialised nations.

Equally important, any effective strategy aimed at reducing the risk of MTCT must first focus on preventing women from

becoming infected in the first place. All other interventions designed to prevent newborn children becoming infected from their mothers depend upon maternal infection being detected before the child is born. Antenatal screening for HIV infection is an essential element of a comprehensive strategy for preventing women giving birth to HIV-infected children (Pratt, 2000).

European Consensus Guidelines on the management of HIV infection during pregnancy (Newell and Rogers, 2002) are available and these are summarised in Table 3. UK-specific guidelines (Lyll et al, 2001) are also available and regularly updated and these can be downloaded from the internet at: <http://www.bhiva.org/guidelines.htm> Finally, guidelines from the USA National Institutes for Health (NIH, 2002) are available as a 'Living Document' on the internet at: <http://www.aidsinfo.nih.gov/guidelines/perinatal/Perinatal.pdf> All three of these guidelines are in general agreement on how best to prevent MTCT of HIV and nurses, midwives and other healthcare professionals working within this field need to be familiar with their recommendations and advice.

Risk to infants of HIV transmission from breast feeding

The importance of antenatal screening for HIV infection and the evidence for the efficacy of antiretroviral chemoprophylaxis and caesarean section delivery for reducing the risk of MTCT has previously been described in this journal and elsewhere (Pratt, 1999; 2000; 2003) However, there remains some confusion over the recommendations (Newell and Rogers, 2002; Lyll et al, 2001; NIH, 2002) for modifying infant feeding practices to prevent viral transmission.

There are considerable advantages to both mother and infant in breast feeding, especially during the first six months of life. Throughout the world, breast feeding protects against respiratory infections and diarrhoeal disease, two of the most important causes of childhood mortality, and it has significant economical, social, psychological and family planning advantages. However, in HIV-infected mothers, both cell-free and cell-associated virus have been consistently identified in colostrum and mature milk and the transmission of HIV in

Antenatal screening	All pregnant women, and ideally, those planning a pregnancy, are offered and recommended to have an HIV test. HIV testing should also be offered to their sexual partner(s).
Caesarean section (CS) delivery	HIV-infected women should be given the option of delivering their child through a CS performed before labour and before rupture of membranes (usually at 38 weeks' gestation).
Antiretroviral therapy	All HIV-infected women should be offered therapy during pregnancy for their own health depending on their clinical status and prognostic markers. Antiretroviral treatment can begin after the first trimester. Most antiretroviral drugs have not been shown to be associated with an increased risk for birth defects (teratogenicity) except efavirenz, zalcitabine and hydroxyurea, which are contraindicated during pregnancy.
Antiretroviral chemoprophylaxis	A 3-part zidovudine (ZDN) regimen is used as the standard chemoprophylaxis to prevent MTCT; ZDN is given during pregnancy, during labour and in the neonatal period, commencing at 28-32 weeks' gestation (with elective CS delivery at 38 weeks gestation). If CS delivery is not an option, in addition to ZDN: two doses of nevirapine may be given once labour has been established or lamivudine (3TC) may also be given with ZDN
Breast feeding	HIV-infected women are strongly advised to refrain from breast feeding where safe infant-feeding alternatives are available. Women who cannot refrain from breast feeding should be advised to: Exclusively breast feed and not introduce other foods or drinks for 4-6 months; Breast feed for as short a time as possible, with rapid cessation.
Follow-up of children born to HIV-infected mothers	Long-term follow-up of all children born to HIV-infected mothers should continue, at least until school age.

Table 3. Summary of European Consensus Guidelines on the Management of HIV Infection in Pregnancy (Newell and Rogers, 2002).

breast milk, occurring at any point during lactation, has been well documented (Nduati, 1998).

Several factors are involved in or associated with HIV transmission via breast milk. High levels of maternal viraemia (high viral load) will increase the amount of HIV secreted in breast milk and, consequently, increase the amount and duration of HIV exposure to the infant. Vitamin A deficiency in HIV-infected mothers is associated with cracked nipples (and increased vaginal shedding of HIV) which may be an additional source of viral exposure to the infant (John et al, 1997). Infant prematurity results in an immature neonatal immune system unable to mount an effective cell-mediated response to HIV and is associated with an increased risk of viral acquisition from breast feeding (John et al, 1997; Ekpini et al, 1997).

The actual mechanism of HIV transmission by breast milk is not fully understood. However, neonatal mucus membranes cannot effectively prevent HIV infection and exposure to HIV in breast milk may result in viral infection directly through oral and gastric mucosa (Nduati, 1998). Other conditions that may disrupt the integrity of neonatal oral mucosa, e.g., candidiasis, have been associated with an increased risk of HIV infection from breast milk (Ekpini et al, 1998).

The amount of HIV secreted in breast milk is highest during the first few months following delivery and 70% of postnatal transmission takes place within the first four to six months of

life (Fautaini, 1997; Simonon et al, 1994).

Avoidance of breast feeding and the use of breast milk substitutes will substantially reduce postnatal mother-to-child HIV transmission and this strategy is recommended in industrialised countries, including the UK, where safe alternatives to breast feeding are available (Newell and Rogers, 2002; Lyall et al, 2001; NIH, 2002). Globally, however, most infants at risk of postnatal mother-to-child HIV transmission are breast fed. In many cultures and in many regions of the developing world, it is neither possible nor acceptable for women not to breast feed their infants.

Exclusive breast feeding

Studies conducted in South Africa found evidence that women who exclusively breast feed had a lower rate of MTCT than those mothers who also fed their babies other fluids or food together with breast feeding (mixed infant feeding) (Coutsoudis et al, 1999b; 2001). Potential mechanisms that might explain a reduced risk for MTCT when children are exclusively breast fed include (Smith and Kuhn, 2000)

- reduction in dietary antigens and enteric pathogens from fluids and food, helping to maintain the integrity of the intestinal mucosal barrier and limit the inflammatory responses to the gut mucosa

- promotion of beneficial intestinal microflora that may increase resistance to infection and enhance the infant's immune responses
- the beneficial antimicrobial, anti-inflammatory and immuno-modulating properties of breast milk.

Consequently, if there are no consistently safer alternatives to breast feeding for HIV-infected mothers, exclusive breast feeding is the second best option for reducing the risk of MTCT in the postnatal period. However, it must be realised that many mothers in resource poor countries of the world, suffering malnutrition and poor health themselves, may not produce enough breast milk to be able to exclusively breast feed their babies and they will manage the best they can by mixed infant feeding.

Practical considerations

With the current emphasis on breast feeding in UK maternity units, it is important that women choosing to bottle feed do not feel stigmatised (DoH, 2003; UNICEF, 2003). African women resident in the UK, and women from many other ethnic groups, traditionally breast feed their babies. A decision to bottle feed, especially if associated with a delivery by caesarean section, may raise suspicion of their HIV status among other members of their family, neighbours and in their community. Because of this, it is important that the decision about infant feeding is raised as soon as a diagnosis of maternal HIV infection is known and neonatal nurses and midwives specialising in the care of HIV positive women are well placed to take on this role.

Woman may associate not breast feeding with not being a good mother and time needs to be given to explore such feelings. The mother also needs time to prepare a story as to why she is not breast feeding. A plausible excuse needs to be developed, such as an illness during pregnancy or inadequate lactation, and the mother needs to rehearse this and feel comfortable with her alibi.

In the postnatal period, staff need to adopt a positive approach to bottle feeding and offer appropriate support. This includes establishing bottle feeding and the making up of feeds. If the mother has limited finances, as in the case of asylum seekers, assistance may be needed to acquire the necessary equipment. Prior to discharge home, many maternity units are able to provide limited supplies of formula milk and equipment needed to sterilise bottles and other equipment. However, nursing or midwifery staff should ensure the mother has access to the necessary funds to support consistent bottle feeding and knows where to purchase future supplies. Failure to do so could result in the mother resorting to mixed infant feeding, the dangers of which have already been described.

At all times confidentiality about the woman's HIV status must be maintained. Unfortunately, anecdotal reports about staff not maintaining patient confidentiality continue to occur. Although the risk of MTCT can be significantly reduced by the interventions described in this paper, in some instances, infants will still become infected. Consequently, the postnatal period is an anxious time for parents as they await the results of HIV tests on their newborn baby.

In-service educational sessions that address issues about

HIV-infected woman and children must be part of the regular programme so that staff can feel confident and competent to care for and support these mothers and their infants in the best way possible.

Conclusion

In most countries, the children of HIV-infected mothers will find themselves born into a world where they are immediately disadvantaged. Most will eventually be orphaned as the result of the AIDS-related deaths of their parents and by 2010, more than 25 million children are projected to lose one or both parents due to HIV disease (USAID, 2002). The majority of these children will be stigmatised, impoverished and deprived of even basic needs for food, water, shelter and protection. Their chances of survival will be diminished even further if they have also become infected from their mothers before, during or after birth.

In this discussion we have seen that we have the ability to prevent MTCT of HIV to infants. However, the necessary counselling, testing and treatment needed to do this is hampered by a geographical lottery, where children born in countries with poorly organised and starkly under-resourced prenatal healthcare services will be at most risk. Already millions of children have been infected and thousands more are becoming infected every day (UNAIDS/WHO, 2002).

References

- Anderson, J.R.** (2001) HIV and Reproduction. In: Anderson JR, ed. A Guide to the Clinical Care of Women with HIV. Washington DC: U.S. Department of Health and Human Services, Health Resources and Services Administration, HIV/AIDS Bureau; 7: 213-73.
- Bulterys, M., Landseman, S., Burns, D.N., Robinstein, A., Goedert, J.** (1997) Sexual behavior and injection drug use during pregnancy and vertical transmission of HIV-1. *Journal of the Acquired Immune Deficiency Syndrome and Human Retrovirology* **15**:76-82.
- Coutsoudis, A., Pillay, K., Spooner, E., Khun, L., Coovadia, H.M.** (1999a) Randomized trial testing the effect of vitamin A supplementation on pregnancy outcomes and early mother-to-child HIV-1 transmission in Durban, south Africa. South African Vitamin A Study Group. *AIDS* **13**:1517-24.
- Coutsoudis, A., Pillay, K., Spooner, E., Kuhn, L., Coovadia, H.M.** (1999b) Influence of infant-feeding patterns on early mother-to-child transmission of HIV-1 in Durban, South Africa: a prospective cohort study. South African Vitamin A Study Group. *Lancet* **354**(9177):471-76.
- Coutsoudis, A., Pillay, K., Kuhn, L., Spooner, E., Tsai, W.Y., Coovadia, H.M.** (2001) Method of feeding and transmission of HIV-1 from mothers to children by 15 months of age: Prospective cohort study from Durban, South Africa. *AIDS* **15**(3):379-87.
- Department of Health.** (2003) Getting the right start. National Service Framework for Children: Standard for Health Services.
- Ekpini, E., Wikto, S.Z., Satten, G.A. et al.** (1997) Late postnatal transmission of HIV-1 in Abidjan, Côte d'Ivoire. *Lancet* **349**:1054-59.
- Embree, J.E., Njenga, S., Datta P. et al.** (2000) Risk factors for postnatal mother-to-child transmission of HIV-1. *AIDS* **14**(16):2535-41.
- European Collaborate Study.** (2001) HIV-infected women and vertical transmission in Europe since 1986. *AIDS* **15**:761-70.
- European Mode of Delivery Collaboration.** (1999) Elective caesare-

- an-section versus vaginal delivery in prevention of vertical HIV-transmission: A randomised clinical trial. *Lancet* **353**:1035-9.
- Fang, G., Burger, H., Anastos, K. et al.** (1998) Sequence analysis of the complete HIV-1 pol gene from virions in plasma and genital tract of women: Genital tract reservoir and differential drug resistance. HIV Pathology and Treatment Conference. Abstracts (Abst 4025), March 13-19.
- Fantaini, J., Yahi, C., Delezay, O., Tamalet, C.** (1997) HIV transmission across the vaginal epitheliums. *AIDS* **11**:1663.
- Garcia, P.M., Kalish, L.A., Pitt, J. et al.** (1999) Maternal levels of plasma human immunodeficiency virus type-1 RNA and the risk of perinatal transmission. *New England Journal of Medicine* **341**:394-402.
- Goldenbert, R.L., Vermund, S.H., Soepfert, A.R., Andrews, W.W.** (1998) Choriodecidual inflammation. A potentially preventable cause of perinatal HIV-1 transmission? *Lancet* **352**:1927-30.
- International Perinatal HIV Group.** (1999) The mode of delivery and the risk of vertical transmission of human immunodeficiency virus type-1. *New England Journal of Medicine* **340**:977-87.
- John, G.C., Nduati, R.W., Mbori-Ngacha, D. et al.** (1997) Genital shedding of human immunodeficiency virus type 1 DNA during pregnancy: Association with immunosuppression, abnormal cervical and vaginal discharge and severe vitamin A deficiency. *Journal of Infectious Disease* **175**: 57-62.
- John, G.C., Nduati, R.W., MboriNgacha, D. et al.** (2001) Correlates of mother-to-child human immunodeficiency virus type 1 (HIV-1) transmission: Association with maternal plasma HIV-1 RNA load, genital HIV-1 DNA shedding, and breast infections. *Journal of Infectious Diseases* **183**(2):206-12.
- Kuhn, L., Abrams, E.J., Matheson, P.B. et al.** (1997) Timing of maternal-infant HIV transmission: Associations between intrapartum factors and early polymerase chain reaction results. New York City Perinatal HIV Transmission collaborative Study Group. *AIDS* **11**:429-35.
- Kuhn, L., Steketee, R.W., Weedon, J. et al.** (1999) Distinct risk factors for intrauterine and intrapartum human immunodeficiency virus transmission and consequences for disease progression in infected children. New York City Perinatal HIV Transmission Collaborative Study Group. *Journal of Infectious Diseases* **179**:52-8.
- Leroy, V., Newell, M.L., Dabis, F. et al.** (1998) International multi-centre pooled analysis of late postnatal mother-to-child transmission of HIV-1 infection. Ghent International Working Group on Mother-to-Children Transmission of HIV. *Lancet* **352**(9128):597-600.
- Lyll, E.G.H., Blott, M., de Ruiter, A. et al.** (2001) Guidelines for the management of HIV infection in pregnant women and the prevention of mother-to-child transmission. British HIV Association. *HIV Medicine* **2** (4):314-30. Available from: <http://www.bhiva.org/guidelines.htm>
- Lyman, W.D.** (1993) Perinatal AIDS: Drugs of abuse and transplacental infection. *Advances in Experimental Medicine and Biology* **335**: 211-17.
- Maiques, V., Garcia-Tejedor, A., Perales, A., Navarro, C.** (1999) Intrapartum fetal invasive procedures and perinatal transmission of HIV. *European Journal of Obstetrics, Gynecology, and Reproductive Biology* **87**:63-7.
- Mandelbrot, L., Mayaux, M.J., Bongain, A. et al.** (1996) Obstetric factors and mother-to-child transmission of human immunodeficiency virus type 1: The French perinatal cohorts. SEROGEST French Pediatric HIV Infection Study Group. *American Journal of Obstetrics and Gynecology* **175**:661-7.
- Miotti, P.G., Taha, T.E., Kumwenda, N.I. et al.** (1998) HIV transmission through breastfeeding: A study in Malawi. *Journal of the American Medical Association* **282**:744-49.
- Mirochnick, M., Fenton, T., Gagnier, P. et al.** (1998) Pharmacokinetics of nevirapine in human immunodeficiency virus type 1- infected pregnant women and their neonates. *Journal of Infectious Diseases* **178**:368-74.
- National Institutes of Health (Perinatal HIV Guidelines Working Group).** (2002) Revisions to the February 4, 2002 Public Health Service Task Force Recommendations for the use of antiretroviral drugs in pregnant women infected with HIV-1 for maternal health and for reducing perinatal HIV-1 transmission in the United States August 30. Available from: <http://www.aidsinfo.nih.gov/guidelines/perinatal/Perinatal.pdf>
- Nduati, R.** (1998) HIV and Infant Feeding: A Review of HIV Transmission Through Breastfeeding 1998. WHO/FRH/NUT 98.3, UNAIDS/98.5; Geneva. 1-26.
- Nduati, R., John, G., MboriNgacha, D. et al.** (2000) Effects of breastfeeding and formula feeding on transmission of HIV-1: A randomized clinical trial. *Journal of the American Medical Association* **283**: 1167-74.
- Newell ML, Rogers R, eds.** (2002) Pregnancy and HIV Infection: a European Consensus on Management. *AIDS* **16**(Suppl 2):S1-S-18.
- Plummer, F.A.** (1998) Heterosexual transmission of human immunodeficiency virus type 1 (HIV): Interactions of conventional sexually transmitted diseases, hormonal contraception and HIV-1. *AIDS Research and Human Retroviruses* **14**(Suppl 1):S5-10.
- Pratt, R.J.** (1999) Perinatal HIV infection in 1999: Effective preventative strategies. *Journal of Neonatal Nursing* **5**(2):37-41.
- Pratt, R.J.** (2000) Antenatal screening for HIV infection: Removing tomorrow's children from harm's way. *Journal of Neonatal Nursing* **6**(6):179-84.
- Pratt RJ.** (2003) Preventing Mother-to-Child Transmission. In: HIV&AIDS: A Foundation for Nursing and Healthcare Practice 5th ed. London: Arnold.
- Read, J. for the International Perinatal HIV Group.** (2000) Duration of ruptured membranes and vertical transmission of HIV-1: A meta-analysis from fifteen prospective cohort studies. 7th Conference on Retroviruses and Opportunistic Infections. Abstracts (Abst 659), January 30-February 02.
- Read, J.S., Newell, M.L., Dabis, F., Leroy, V.** (2002) Breast feeding and late postnatal transmission of HIV-1: An individual patient data meta-analysis (Breastfeeding and HIV International Transmission Study). 15th International AIDS Conference. Abstracts (Abst TuOrB1177), July 7-12.
- Rodriguez, E.M., Mofenson, L.M., Chang, B.H. et al.** (1996) Association of maternal drug use during pregnancy with maternal HIV culture positivity and perinatal HIV transmission. *AIDS* **10**: 273-82.
- Simonon, A., Lepage, P., Karita, E. et al.** (1994) An assessment of the timing of mother-to-child transmission of human immunodeficiency virus Type 1 by means of polymerase chain reaction. *Journal of Acquired Immune Deficiency Syndromes* **7**:952-57.
- Smith, M.M. and Kuhn, L.** (2000) Exclusive breast-feeding: Does it have the potential to reduce breast-feeding transmission of HIV-1? *Nutritional Review* **58**(11):333-40.
- UNAIDS/WHO.** (2002) AIDS Epidemic Update. (UNAIDS/02.58E). Geneva: Joint United Nations Programme on HIV/AIDS (UNAIDS) & the World Health Organization (WHO): http://www.unaids.org/worldaidsday/2002/press/update/epiupdate_en.pdf
- UNICEF.** (2003) UK Baby Friendly Initiative. Baby friendly hospitals. <http://www.babyfriendly.org.uk>

U.S. Agency for International Development, United Nations Children's Fund, Joint United Nations Programme on HIV/AIDS. (2002) Children on the Brink 2002: A Joint Report on Orphan Estimates and Program Strategies. Washington DC: TvT Associates/The Synergy Project.
<http://www.synergyaids.com/documents/COB2002.pdf>

Internet resources

- Anderson JR (ed.). A Guide to the Clinical Care of Women with HIV 2001 ed. U.S. Department of Health and Human Services, Health Resources and Services Administration, HIV/AIDS Bureau. This excellent practical text comprehensively describes the care and treatment of HIV-infected women is available free (online, CD and hard copy available.) and is regularly updated. Hard copy can be obtained free of charge by contacting: Womenscare, Parklawn Bldg., Rm 11A-33, 5600 Fishers Lane, Rockville, Maryland 20857, USA; Fax: +1-301-443-0791; or e-mail: <womenscare@hrsa.gov>.
<http://www.hab.hrsa.gov/>
- Questions and Answers on MTCT are available from the UNAIDS website at:
<http://www.unaids.org/publications/documents/mtct/qaweb99.html>
- The Baby Friendly Initiative is a global programme of UNICEF and the World Health Organization which works with the health services to improve practice so that parents are enabled and supported to make informed choices about how they feed and care for their babies.
<http://www.babyfriendly.org.uk>

CBE for TVU Professor

Congratulations to one of our authors, Robert Pratt, Professor of Nursing and Director of the Richard Wells Research Centre in Thames Valley University's Faculty of Health and Human Sciences, who has been appointed a Commander of the Order of the British Empire. This great honour was announced in the Queens Birthday Honours List on 14 June.



Professor Pratt has been a prominent and influential figure developing care strategies for persons with HIV disease since the beginning of the global pandemic. During the last five years, he and his group have developed a series of national evidence-based guidelines for preventing healthcare-associated infections on behalf of the Department of Health and the National Institute for Clinical Excellence.

A Photographic Memory

The Child Bereavement Trust has recently produced a booklet entitled "A photographic memory", which is designed as guidance for professionals responsible for offering parents photographs at the time of their baby's death. As the booklet states "A picture paints a thousand words" and the guide encourages professionals caring for parents whose baby is dying or has died, to think about the importance of photographs as part of the care offered to families.

The content of the booklet is based on what bereaved parents have appreciated about the photographs taken by professionals when their baby died. Parents share their precious photographs and feelings about their children.

The value of the booklet is in the way it sensitively demonstrates how to take photographs of a dead baby that parents will treasure. For example photographs of tiny, perfect little hands or feet; a picture of a little boy holding his dead sister; a photograph of a dead twin beside her living sibling.

At the back of the booklet practical information is given including using polaroid and digital cameras, as well as the use of black and white photography.

Copies of the booklet have already been distributed free of charge to each maternity and neonatal unit in the UK and further copies are available for purchase from The Child Bereavement Trust at a cost of £7.50 or 4 copies for £25. Contact CBT on enquiries@childbereavement.org.uk or 0845 357 1000.

