

Treatment as prevention (TasP) for HIV

TasP.jpg



Treatment as prevention (TasP) refers to HIV prevention methods that use antiretroviral treatment (ART) to decrease the risk of HIV transmission. Antiretroviral treatment reduces the HIV viral load in the blood, semen, vaginal fluid and rectal fluid to very low levels ('undetectable'), reducing the risk of onwards HIV transmission.¹

For a number of years now, there has been growing evidence of the benefits of HIV treatment as a prevention method. In 2011 a landmark study, HPTN 052, showed early initiation of antiretroviral treatment in people living with HIV with a CD4 count between 350 and 550, reduced HIV transmission to HIV-negative partners by 96%.²

A number of follow-up studies since have also reported significant reductions in HIV transmission, with new infections averted as a result.^{3 4 5 6}

This has led to the idea that treatment as prevention could be used as part of a 'test and treat' strategy - increasing testing and treatment coverage to decrease community viral load and reduce the rate of new HIV infections.^{7 8}

Following the results of HPTN 052, Executive Director of UNAIDS Michel Sidibé, commented:

"This breakthrough is a serious game changer and will drive the prevention revolution forward. It makes HIV treatment a new priority prevention option." ⁹

HIV treatment is already being used as prevention

Prevention of mother-to-child transmission (PMTCT)

Treatment as prevention has been used since the mid-1990s to [prevent mother-to-child transmission \(PMTCT\) of HIV](#). In 1994, research showed how zidovudine reduced the vertical transmission of HIV from HIV-infected mothers to their babies from 25% to 8%.¹⁰

Since then, testing [pregnant women](#) and treating HIV-positive mothers with antiretroviral drugs (ARVs) during pregnancy, delivery and breastfeeding has been found to reduce the risk of a mother transmitting HIV to her child by up to 90%.[11](#)

One study from the [United Kingdom \(UK\)](#) and Ireland found that pregnant women who received at least 14 days of treatment reduced the risk of transmitting HIV to their babies to less than 1%.[12](#)

Pre-exposure prophylaxis (PrEP)

Pre-exposure prophylaxis (PrEP) uses antiretroviral drugs to protect HIV-negative people from HIV before potential exposure. Trials have shown that when taken consistently and correctly, PrEP is very effective.[13](#) [14](#)

As a result, like TasP, it potentially has population-wide benefits. However, if not taken routinely and consistently, PrEP is much less effective. It is important that PrEP is offered as part of a combination package of prevention initiatives, and does not replace other, more effective methods like condoms.[15](#)

In 2015, the World Health Organization released new guidelines and a policy brief recommending that PrEP should be offered as a choice to people who are at substantial risk of HIV infection. Previously, it was only recommended for certain [key affected populations](#) such as [sex workers](#), [men who have sex with men](#) and [people who inject drugs](#).[16](#) [17](#)

Microbicides

Microbicides are gels or creams containing antiretroviral drugs that are applied to the vagina to help prevent HIV infection. Vaginal microbicides are effective, so long as they are used consistently and correctly. One study observed 39% fewer infections, but its findings have not been replicated.[18](#)

The main challenge is adherence - in other words, creating a product that women who are at high risk of HIV infection are able to use regularly. In this respect, the issues for microbicides and PrEP are comparable. In fact, a microbicide gel is essentially a different way to deliver PrEP and is sometimes referred to as 'topical PrEP'.[19](#)

There is also ongoing work into rectal microbicides suitable for use during anal sex.[20](#)

Post-exposure prophylaxis (PEP)

Post-exposure prophylaxis (PEP) is short-term antiretroviral treatment taken after possible exposure to HIV.

Since 1998, it has been used by healthcare workers who may have been exposed to HIV-infected fluids.[21](#) More recently, it has been used to treat those who may have been exposed during a single event (for example sexual assault, unprotected sex or sharing drug injecting equipment).[22](#)

More research is needed into the effectiveness of PEP as an HIV prevention strategy. One trial from the mid-1990s, which gave zidovudine to healthcare workers exposed to HIV, prevented transmission in 81% of cases.[23](#) However, its use in PEP has since been replaced by tenofovir as a component of a three-drug combination.[24](#)

Test and treat strategies

'Test and treat' programmes are based on the premise that the rate of new HIV infections can be reduced by rolling out universal HIV testing in order to diagnose all people living with HIV, and initiate antiretroviral treatment regardless of CD4 count or viral load.[25](#)

One study from [South Africa](#) estimated that the implementation of universal voluntary HIV testing

for adults over 15 years old would decrease HIV prevalence to 1% within 50 years.²⁶

Case study: 'Test and treat' in Hlabisa

The first of five massive randomised studies into 'test and treat' strategies took place between 2012 and 2016. ANRS 12249 was carried out in a poor rural area of KwaZulu-Natal, where three-in-ten people are living with HIV - the highest prevalence in South Africa.

The main aim of the research was to examine the population impact of scaling up treatment as prevention, whereby antiretroviral treatment (ART) is used to decrease individuals' viral load and thereby decrease the risk of onward HIV transmission.

The results showed that those diagnosed often did not link with medical care, or took many months to do so - with only 49% of people diagnosed ultimately taking treatment. This weak link in the test and treat chain limited the number of people who went on to achieve an undetectable viral load to 42.4% of the population, reducing the population level HIV prevention impact.

Trials testing the effectiveness of treatment as prevention for the general population in high HIV prevalence settings are currently ongoing. The HPTN 071 study, known as PopART, is currently carrying out a large scale trial in 21 communities across South Africa and Zambia.²⁷

The trial aims to measure the costs and benefits of a combination package of interventions that includes door-to-door voluntary HIV testing and immediate treatment for HIV-positive individuals regardless of CD4 count. The five-year project runs until 2017.²⁸

A 2016 study in India among men who have sex with men and people who inject drugs found a clear correlation between treatment, viral suppression and HIV incidence in large populations - although long-term follow up is needed.²⁹

Limitations of treatment as prevention

TasP is not 100% effective

Following the results of the HPTN 052 study, in 2013, the World Health Organization recommended that antiretroviral treatment be offered to all people living with HIV who have uninfected partners to reduce HIV transmission.³⁰

However, even if all mixed status couples had access to treatment, it is widely agreed that this would not bring an end to the epidemic. If the preventative benefits of treatment are overstated, people are more likely to engage in high-risk behaviours. Research from Switzerland showed how increased access to antiretroviral treatment can lead to a reduction in other HIV prevention measures such as condom use.³¹

Furthermore, a 2013 study from [China](#) of 38,000 mixed status couples reported that treating the HIV-infected partners reduced the risk of HIV transmission to the uninfected partner by a comparatively low 26%.³² In the HPTN 052 study, 30% of HIV-positive people had an external partner.³³

More recently however, results from a four-year study conducted across 14 European countries, which observed HIV serodifferent couples (where the HIV-positive partner was taking suppressive ART), found zero transmissions after couples had sex 58,000 without a condom. The study, which included both straight and gay couples, provides good evidence for the effectiveness of TasP. ³⁴

Adherence is vital to its success

The success of treatment as prevention is highly dependent upon people adhering to their treatment. It is widely agreed that once treatment is initiated it should not be interrupted, as incomplete viral suppression causes the more sensitive strains of HIV to be suppressed and the resistant strains to become dominant. Resistant strains are harder to treat.³⁵

Adherence is an issue even where treatment is widely available. In 2011, one study from the [United States of America \(USA\)](#) reported that 15 years after the initiation of highly active antiretroviral therapy (HAART), and four years after the introduction of combination prevention, only 19% of 1.1 million people living with HIV in the country had an undetectable viral load.³⁶

In South Africa, which has the largest treatment programme in the world, a study found that only 64% of people who were initiated on treatment between 2002 and 2007 were still in care three years on.³⁷

Multidrug-resistant HIV

There are also concerns that the widespread use of antiretroviral treatment at a population level to reduce the number of new HIV infections could lead to a significant increase in levels of multidrug-resistant HIV.

The dramatic scaling up of treatment could see increases in non-adherence resulting in the development of resistant strains of the virus.³⁸ One study from Los Angeles County, USA, reported that the use of 'test and treat' among men who have sex with men could almost double the prevalence of multidrug-resistant HIV cases from 4.8% to 9.1% by 2023 among this group.³⁹

Despite legitimate arguments about treatment adherence and drug resistance, many argue that interventions should be implemented regardless given the prevention benefits and how existing combination treatment has proved effective in suppressing viral load. Moreover, there remains a lot of scope to improve the current delivery of treatment through improved monitoring of treatment adherence as well as strengthening the links between treatment and care.⁴⁰

The future of treatment as prevention

Treatment as prevention has a lot of potential in reducing population level rates of HIV transmission by increasing uptake of HIV testing, offering treatment and linking people to care.⁴¹

However, its effectiveness relies, at least in part, on the willingness and ability of people on treatment to remain in care and follow their prescribed course of antiretroviral drugs correctly. A number of studies have promoted a combination of cognitive, behavioural and mixed interventions including emotional support as a means of improving adherence.^{42 43 44}

Others have suggested that more research is needed in order to identify the most effective way of delivering TasP. Research from Botswana has modelled the benefits of targeting such a strategy at people with the lowest CD4 counts.⁴⁵

Bigger challenges and questions remain around its implementation in resource-limited settings. Its success depends much upon the ability of a country's healthcare service to deliver these services.^{46 47} However, with trials ongoing, the burden of adding treatment-based prevention to already strained healthcare systems remains unknown.⁴⁸

Ethical and public health concerns have also been raised about how limited supplies of antiretroviral drugs in resource-limited countries are distributed - for treatment, prevention or both. One study concludes it is "unethical to watch patients with treatable AIDS worsen and die, even with supportive care, so that medications for treatment can be diverted for prevention."⁴⁹ However, others maintain that while TasP requires large financial investments and poses significant

implementation challenges, it is potentially a highly cost-effective approach to reducing both new HIV infections and the overall global HIV burden.⁵⁰

Overall, there is wide support for treatment as an HIV prevention measure, especially in those with CD4 counts under 350. Treatment for this group must be scaled up, with healthcare systems working to increase adherence and retention in care.

It is widely acknowledged that treatment alone will not end the global HIV epidemic. In order to be effective, treatment needs to be delivered as part of a comprehensive package of prevention methods including HIV and sexual and reproductive health education, condom use and behaviour change.⁵¹

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- 1. World Health Organization (WHO) (2012) 'Antiretroviral treatment as prevention (TASP) of HIV and TB'
- 2. Cohen, M.S. et al (2011) 'Prevention of HIV-1 Infection with Early Antiretroviral Therapy' *The New England Journal of Medicine* 365(5):493-505
- 3. Baeten, J.M. et al (2012) 'Antiretroviral Prophylaxis for HIV Prevention in Heterosexual Men and Women' *The New England Journal of Medicine* 367(5):399-410
- 4. Thigpen, M.C. et al (2012) 'Antiretroviral Preexposure Prophylaxis for Heterosexual HIV Transmission in Botswana' *The New England Journal of Medicine* 367:423-434
- 5. Das, M. et al (2010) 'Decreases in Community Viral Load Are Accompanied by Reductions in New HIV Infections in San Francisco' *PLOS One* 5(6):e11068
- 6. Rodger, A.J. et al (2016) 'Sexual Activity Without Condoms and Risk of HIV Transmission in Serodifferent Couples When the HIV-Positive Partner Is Using Suppressive Antiretroviral Therapy', *The Journal of the American Medical Association*, Vol 316, No.2
- 7. CATIE (2013) 'Treatment as prevention: do the individual prevention benefits translate to the population level?'
- 8. Solomon, S.S et al (2016) 'Community viral load, antiretroviral therapy coverage, and HIV incidence in India: a cross-sectional, comparative study' *The Lancet HIV* 3(4): 183-190
- 9. UNAIDS (2011, 12 May) 'Groundbreaking trial results confirm HIV treatment prevents transmission of HIV'
- 10. Connor, E.M. et al (1994) 'Reduction of Maternal-Infant Transmission of Human Immunodeficiency Virus Type 1 with Zidovudine Treatment' *The New England Journal of Medicine* 331:1173-1180
- 11. Centers for Disease Control and Prevention (CDC) (2006) 'Achievements in Public Health: Reduction in Perinatal Transmission of HIV Infection --- United States, 1985--2005' *Morbidity and Mortality Weekly Report* 55(21):582-597
- 12. Townsend, C.L. et al (2008) 'Low rates of mother-to-child transmission of HIV following effective pregnancy interventions in the United Kingdom and Ireland, 2000-2006' *AIDS* 22(8):973-981
- 13. McCormack, S., et al (2014) 'Pre-exposure prophylaxis to prevent the acquisition of HIV-1 infection (PROUD): effectiveness results from the pilot phase of a pragmatic open-label randomised trial' *The Lancet* 387(10013):53-60
- 14. San Francisco Department of Public Health, Population Health Division (2015) 'HIV Epidemiology Annual Report 2014'
- 15. UNAIDS (2015) 'Oral pre-exposure prophylaxis: putting a new choice in context'
- 16. World Health Organization (WHO) (2015) 'Guideline on when to start antiretroviral therapy and on pre-exposure prophylaxis for HIV'
- 17. World Health Organization (WHO) (2015) 'Policy brief: WHO expands recommendation on oral pre-exposure prophylaxis of HIV infection (PrEP)'
- 18. Abdool Karim, S. et al (2010) 'Effectiveness and Safety of Tenofovir Gel, an Antiretroviral Microbicide, for the Prevention of HIV Infection in Women' *Science* 329(5996):1168-1174
- 19. Shattock, R.J. and Rosenberg, Z. (2012) 'Microbicides: Topical Prevention against HIV' *Cold Spring Harbor Perspectives in Medicine* 2(2):a007385

- 20. Microbicide Trials Network (MTN) (2013, 2 October) 'Researchers Launch First-Ever Phase II Safety Study of a Rectal Microbicide to Prevent HIV'
- 21. Henderson, D.K. and Gerberding, J.L. (1989) 'Prophylactic zidovudine after occupational exposure to the human immunodeficiency virus: an interim analysis' *The Journal of Infectious Diseases* 160(2):321-327
- 22. Smith, D.K. et al (2005) 'Antiretroviral Postexposure Prophylaxis After Sexual, Injection-Drug Use, or Other Nonoccupational Exposure to HIV in the United States' *Morbidity and Mortality Weekly Report* 54(2):1-20
- 23. Cardo, D.M. et al (1997) 'A Case-Control Study of HIV Seroconversion in Health Care Workers after Percutaneous Exposure' *The New England Journal of Medicine* 337:1485-1490
- 24. British HIV Association (BHIVA) (2014, 10 September) 'Change to the recommended regimen for post-exposure prophylaxis (PEP)'
- 25. World Health Organization (WHO) (2015) 'Guideline on when to start antiretroviral therapy and on pre-exposure prophylaxis for HIV'
- 26. Granich, M.D. et al (2009) 'Universal voluntary HIV testing with immediate antiretroviral therapy as a strategy for elimination of HIV transmission: a mathematical model' *The Lancet* 373(9657):48-57
- 27. Cori, A. et al (2014) 'HPTN 071 (PopART): A Cluster-Randomized Trial of the Population Impact of an HIV Combination Prevention Intervention Including Universal Testing and Treatment: Mathematical Model' *PLOS One* 9(1):e84511
- 28. London School of Hygiene & Tropical Medicine 'HPTN 071 (PopART)' [accessed 12 April 2017]
- 29. Solomon, S.S et al (2016) 'Community viral load, antiretroviral therapy coverage, and HIV incidence in India: a cross-sectional, comparative study' *The Lancet HIV* 3(4): 183-190
- 30. World Health Organization (2013) 'Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection'
- 31. Hasse, B. et al (2010) 'Frequency and determinants of unprotected sex among HIV-infected persons: the Swiss HIV cohort study' *Clinical Infectious Diseases* 51(11):1314-1322
- 32. Jia, Z. et al (2013) 'Antiretroviral therapy to prevent HIV transmission in serodiscordant couples in China (2003-11): a national observational cohort study' *Lancet* 382(9899):1195-1203
- 33. Cohen, M.S. et al (2011) 'Prevention of HIV-1 Infection with Early Antiretroviral Therapy' *The New England Journal of Medicine* 365(5):493-505
- 34. Rodger, A.J. et al (2016) 'Sexual Activity Without Condoms and Risk of HIV Transmission in Serodifferent Couples When the HIV-Positive Partner Is Using Suppressive Antiretroviral Therapy', *The Journal of the American Medical Association*, Vol 316, No.2
- 35. AIDSinfo (2014) 'Guidelines for the Use of Antiretroviral Agents in HIV-1-Infected Adults and Adolescents'
- 36. Gardner, E.M. et al (2011) 'The Spectrum of Engagement in HIV Care and its Relevance to Test-and-Treat Strategies for Prevention of HIV Infection' *Clinical Infectious Diseases* 52(6):793-800
- 37. Cornell, M. et al (2010) 'Temporal changes in programme outcomes among adult patients initiating antiretroviral therapy across South Africa, 2002-2007' *AIDS* 24(14):2263-2270
- 38. Shelton, J.D. (2011) 'ARVs as HIV Prevention: A Tough Road to Wide Impact' *Science* 334:1645-1646
- 39. ScienceDaily (2013, 18 March) 'Widespread 'test-and-treat' HIV policies could increase dangerous drug resistance'
- 40. Gupta, R.K. et al (2013) 'Oral Antiretroviral Drugs as Public Health Tools for HIV Prevention: Global Implications for Adherence, Drug Resistance, and the Success of HIV Treatment Programs' *The Journal of Infectious Diseases* 207(Supplement 2):101-106
- 41. Smith, L. et al (2011) 'HIV-1 treatment as prevention: the good, the bad, and the challenges' *Current Opinion in HIV and AIDS* 6(4):315-325
- 42. Dewing, S. et al (2014) 'Antiretroviral adherence interventions in Southern Africa: implications for using HIV treatments for prevention' *Current HIV/AIDS Reports* 11(1):63-71
- 43. Scheurer, D. et al (2012) 'Association between different types of social support and medication adherence' *The American Journal of Managed Care* 18(12):461-467
- 44. Jones, D.L. et al (2007) 'Efficacy of a Group Medication Adherence Intervention Among HIV Positive Women: The SMART/EST Women's Project' *AIDS and Behaviour* 11(1):79-86

- 45. Novitsky, V. et al (2010) 'HIV-1 Subtype C-Infected Individuals Maintaining High Viral Load as Potential Targets for the "Test-and-Treat" Approach to Reduce HIV Transmission' PLOS One 5(4):e10148
- 46. Sigaloff, K.C.E. et al (2014) 'Global Response to HIV: Treatment as Prevention, or Treatment for Treatment?' Clinical Infectious Diseases 59(Supplement 1):7-11
- 47. Harries, A.D. et al (2010) 'The HIV-associated tuberculosis epidemic—when will we act?' The Lancet 375(9729):1906-1919
- 48. Padian, N.S. et al (2011) 'HIV prevention transformed: the new prevention research agenda' Lancet 378(9787):269-278
- 49. Macklin, R. et al (2012) 'Given Resource Constraints, It Would Be Unethical To Divert Antiretroviral Drugs From Treatment To Prevention' Health Affairs (Project Hope) 31(7):1537-1544
- 50. Wilson, D. et al (2014) 'The economics, financing and implementation of HIV treatment as prevention: What will it take to get there?' African Journal of AIDS Research 13(2):109-119
- 51. Venkatesh, K.A. et al (2011) 'Is expanded HIV treatment preventing new infections? Impact of antiretroviral therapy on sexual risk behaviors in the developing world' AIDS 25(16):1939-1949

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