Evidence of HIV Treatment and Viral Suppression in Preventing the Sexual Transmission of HIV

HIV treatment has dramatically improved the health, quality of life, and life expectancy of people with HIV.[1,2,3,4] HIV treatment has also transformed the HIV prevention landscape. Over the last decade, research has shown the profound impact of HIV treatment in preventing the sexual transmission of HIV, sometimes called "Treatment as Prevention" (TasP).[1,5,6,7,8,9,10] This fact sheet summarizes the latest evidence, provides key communication messages, and reviews key factors needed to maximize the effectiveness of this prevention strategy.

People with HIV who take HIV medicine as prescribed and get and keep an undetectable viral load (or stay virally suppressed) have effectively no risk of transmitting HIV to their HIV-negative sexual partners.

The Evidence

In 2011, the interim results of the HPTN052 clinical trial[1] demonstrated a 96% reduction in HIV transmission risk among heterosexual mixed-status (also referred to as HIV-discordant) couples where the HIV-positive partner started antiretroviral therapy (ART) immediately versus those delaying ART initiation. The final results published in 2016 reported that there had been no HIV transmissions within these couples when the HIV-positive partner had a suppressed viral load (defined as having a viral load of less than 400 copies of HIV RNA per milliliter).[7] Genetically linked HIV infections were observed between sexual partners in 8 couples; however, all of these transmissions occurred while the HIV-positive partner was not virally suppressed. In other words, linked HIV transmissions occurred only when:

- The HIV-positive partner had started ART but *before* the HIV-positive partner had achieved and maintained viral suppression, or
- The HIV-positive partner had achieved viral suppression but the ART regimen later failed or the partner had stopped taking their medication.

Three recent studies, PARTNER, Opposites Attract, and PARTNER2 (an extension of PARTNER focusing on HIV-discordant MSM couples), report similar results. None of these studies observed any genetically linked infections while the HIV-positive partner was virally suppressed and the couples were engaging in condomless sex and not using pre-exposure prophylaxis (PrEP).[8,9,10] In these studies, viral suppression was defined as less than 200 copies of HIV RNA per milliliter of blood; most HIV-positive participants in the PARTNER study had less than 50 copies of HIV RNA per milliliter of blood.[8] The three studies included over 500 HIV-discordant heterosexual couples, with about half having a male HIV-infected partner (PARTNER), and more than 1,100 HIV-discordant MSM couples (PARTNER2; Opposites Attract) from 14 European countries, Australia, Brazil, and Thailand. Combined, these couples engaged in over 125,000 sex acts without a condom or PrEP over more than 2,600 couple-years of observation.

The studies reported transmission risk estimates and their corresponding 95% confidence intervals as:

- PARTNER study:[8]
  - For any sex among heterosexual and male-male couples: 0.00 (0.00 – 0.30) per 100 couple-years
  - For anal sex among male-male couples: 0.00 (0.00 – 0.89) per 100 couple-years
- Opposites Attract study:[9]
  - For anal sex among male-male couples: 0.00 (0.00 – 1.59) per 100 couple-years
- PARTNER2 study (*which includes data from PARTNER*):[10]
  - For anal sex among male-male couples: 0.00 (0.00 – 0.24) per 100 couple-years

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Division of HIV/AIDS Prevention

All content is based on the most recent data available in December 2018.

Together, the data from the PARTNER2 and Opposites Attract studies produce a combined transmission risk estimate for condomless and PrEP-less anal sex among MSM couples of 0.00 (0.00 – 0.21) per 100 couple-years, with the upper bound equal to a 0.21% annual risk (unpublished data). Pooling data from all three studies produces a combined transmission risk estimate for condomless sex among heterosexual or MSM couples of 0.00 (0.00 – 0.14) per 100 couple-years, with the upper bound indicating a 0.14% annual risk (unpublished data). These data provide conclusive evidence of the power of viral suppression in preventing HIV transmission. Although statistically a non-zero risk estimate can never be completely ruled out in a mathematical sense, despite the number of observations, the data tell us that the best estimate for the transmission risk is zero and that future HIV transmissions are not expected when persons with HIV remain virally suppressed.

Updating Prevention Messages

CDC has increased its communication about TasP since the first studies were reported in 2011.[11,12] In 2017, as additional studies emerged, CDC joined other federal agencies in an effort led by the U.S. Department of Health and Human Services (HHS) to help ensure that each agency communicates the new findings consistently and accurately. This process included reviewing the latest evidence and developing, testing, and finalizing a core message that would communicate effectiveness in a clear, concise, and accurate manner.

The HHS workgroup agreed on the following core prevention message:

> **People with HIV who take HIV medicine as prescribed and get and keep an undetectable viral load (or stay virally suppressed) have effectively no risk of transmitting HIV to their HIV-negative sexual partners.**

The term “effectively no risk” was selected to reflect that while it is not possible to statistically rule out a non-zero risk, all evidence to date suggests that it is not realistically possible to sexually transmit HIV while the person with HIV remains undetectable or virally suppressed. Message testing revealed that information about the prevention benefits of viral suppression was new and difficult to believe for many consumers, underscoring the need to deliver clear communications about this prevention strategy for consumers. The full message testing results will soon be published to help inform additional research and communication efforts moving forward, including how to address challenges in comprehension and message acceptance.

Maximizing the Effectiveness of the Prevention Strategy in Practice

The success of the TasP strategy depends on achieving and maintaining an undetectable viral load. While the majority of people with HIV taking ART are virally suppressed, some people with HIV are currently not virally suppressed or do not maintain viral suppression over time. CDC’s national surveillance data estimate that 60% of all persons living with diagnosed HIV in the United States in 2015 were virally suppressed, defined as less than 200 copies of HIV RNA per mL of blood at most recent test.[13] Among HIV-positive persons in the United States in HIV clinical care (defined as either receiving HIV medical care or having a CD4 or viral load test within the past year), about 80 percent were virally suppressed at their last test.[13,14,15] Also, slightly more than two-thirds of HIV-positive persons in care achieved and maintained viral suppression over 12 months, which means up to one-third (or 1 in 3) did not maintain viral suppression over that time period.[14,15]

About 80% of people in HIV care were virally suppressed at their last test.

About 2/3 of people in HIV care maintain viral suppression over a year.

To help all individuals with HIV and their partners get maximal benefit from this prevention strategy, it will be important to give providers, persons with HIV, and their partners clear information regarding the benefits as well as the challenges with achieving and maintaining viral suppression. The challenges include the following:

Time to viral suppression: Most people will achieve an undetectable viral load within 6 months of starting ART. Many will become undetectable very quickly, but it could take more time for a small portion of people just starting ART.

Adherence to daily treatment: Taking HIV medicine as prescribed is the best way to achieve and maintain an undetectable viral load. Poor adherence, such as missing multiple doses in a month, could increase a person's viral load and their risk for transmitting HIV. People who are having trouble taking their HIV medicine as prescribed can work with health care providers to improve their adherence. If an individual is experiencing adherence challenges, other prevention strategies could provide additional protection until the individual's viral load is confirmed to be undetectable.

Knowledge of viral load: Regular viral load testing is critical to confirm that an individual has achieved and is maintaining an undetectable viral load. It is not known if viral load testing should be conducted more frequently than currently recommended for treatment if someone is relying on treatment and viral suppression as a prevention strategy. Data show a discordance between some people's self-report of their viral load status and laboratory measurements, suggesting that people may not know or be able to accurately report their viral load level.[16] Just because someone was virally suppressed in the past does not guarantee they are still virally suppressed. However, the good news is the longer someone is virally suppressed, the more likely they will remain virally suppressed if they continue to take HIV medicine as prescribed.

Stopping HIV medication: If an individual stops taking their HIV medicine, their viral load will increase, in some cases within a few days, and eventually return to around the same level it was before starting their HIV medicine. People who have stopped taking their HIV medicine should talk to their health care provider as soon as possible about their own health and use other strategies to prevent sexual HIV transmission.

Protection against other STIs: Taking HIV medicine and achieving and maintaining an undetectable viral load does not protect either partner from getting other sexually transmitted infections (STI). Other prevention strategies, such as condoms, are needed to provide protection from STIs.

Lack of knowledge or awareness about the benefits of viral suppression: Knowledge of the prevention benefits of viral suppression may help motivate people with HIV and their partners to adopt this strategy. Recent studies have shown that a significant proportion of people do not know or do not believe that viral suppression works for prevention. For example, CDC's message testing also found that many participants did not believe information about the prevention benefits of viral suppression. And a recent survey among over 12,000 men who have sex with men showed that the majority of HIV-negative participants and nearly one-third of HIV-positive participants thought that a message about the prevention benefits of having an undetectable viral load was inaccurate.[17]

What CDC Is Doing

CDC continues to work with prevention partners across the nation to prioritize efforts to maximize the impact of TasP. CDC has responded with new initiatives that help diagnose people with HIV earlier, link or re-engage them to effective HIV care and treatment, and support adherence to HIV treatment to achieve viral suppression and ultimately reduce transmission.[18,19,20] CDC has also been working to increase awareness of the full range of available prevention strategies. Multiple education campaigns and online risk reduction tools and resources provide information on different prevention strategies and their effectiveness.[21,22]

Next Steps in Communicating the Evidence

CDC will conduct additional research and work with partners to increase awareness, improve message acceptance, and identify the best ways to communicate the benefits of treatment as prevention, as well as the importance of achieving and maintaining an undetectable viral load. At the same time, we will work to effectively communicate about all HIV prevention options to help people who are HIV-negative and those who are HIV-positive but cannot maintain viral suppression, make prevention decisions that are right for them. As we move forward, it will be critical not to stigmatize those who cannot achieve viral suppression and to support those who want to use multiple prevention options.

It is clear that treatment as prevention is one of the most powerful tools we have to stop new transmissions of HIV. As CDC continues programmatic efforts to maximize the impact of TasP, we will continue to integrate the updated messages into existing interventions and training materials to help all funded partners better utilize the new messages and materials. CDC is also updating all web pages and communication products, and funding from the Secretary's Minority AIDS Initiative Fund (SMAIF) will be used to further disseminate new messages and materials to both consumers and health care providers through CDC's *Act Against AIDS* campaigns.

The science makes it clear that while there is still much work to do, this powerful prevention tool has the potential to dramatically reduce new HIV infections and move us closer to a future free of HIV.

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