

# Barrier Methods for Human Immunodeficiency Virus Prevention



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## KEYWORDS

- Human immunodeficiency virus prevention • Male condoms • Female condoms • Microbicides

## KEY POINTS

- Male condoms reduce human immunodeficiency virus transmission via homosexual and heterosexual intercourse by 80% to 90%.
- Male condoms are inexpensive, widely available, and easy to use, but nonadherence, improper use, and poor fit are the greatest barriers to consistent male condom usage.
- Female condoms are similar to male condoms in reducing sexually transmitted disease transmission, but their success has been limited by cost, study design, and delays in approval.
- Microbicides are a promising barrier to vaginal and rectal human immunodeficiency virus transmission.
- Only tenofovir-containing intravaginal gel has shown efficacy in preventing the sexual transmission of human immunodeficiency virus.

## INTRODUCTION

For 3 decades, human immunodeficiency virus (HIV) has been a public health threat and priority, yet the incidence of new infections remains unchanged. Approximately 50,000 new HIV infections have occurred annually since the 1990s despite increased awareness, education, HIV screening, and the introduction of highly effective antiretrovirals.<sup>1</sup> Moreover, heterosexual transmission remains the most common cause of

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new infections worldwide.<sup>2</sup> Since early in the epidemic, condoms have been advocated as an effective physical barrier against HIV transmission. Studies have confirmed that latex condoms protect against HIV-sized particles and homosexual and heterosexual transmission of HIV.<sup>3,4</sup> Not only are condoms inexpensive and widely available, they are also safe, easy to use, and offer effective contraception and prevention against other sexually transmitted diseases.<sup>5</sup> Nonetheless, studies consistently show a 20% condom failure rate likely related to inappropriate or inconsistent usage. When used consistently and correctly, however, condoms reduce HIV infection by a factor of 10 to 20.<sup>4</sup>

Microbicides are a promising barrier to rectal and vaginal HIV transmission. Although several products with varying mechanisms of action have been studied, tenofovir and other antiretrovirals appear to be most effective at reducing viral transmission in animal and human studies.

## MALE CONDOM

### *Types of Male Condoms*

There are 3 main types of condoms: natural rubber latex condoms, synthetic condoms made from polyurethane and other latex-free materials, and membrane condoms made of lamb intestinal products. Latex condoms are well studied with regard to prevention of sexually transmitted infections (STIs) and HIV; synthetic condoms likely have similar effectiveness and are recommended for those with latex allergies. The membrane condom has not been found to reduce HIV transmission and is excluded from most studies of condom effectiveness.<sup>3</sup>

### *Indications*

Condoms are recommended for heterosexual and homosexual intercourse and are protective for both partners. In addition to contraception, condoms offer a barrier against HIV and many STIs.<sup>6</sup> The risk of sexual transmission of HIV depends on several factors: sexual behavior, concurrent STIs, viral load of the infected partner, and circumcision.<sup>7</sup> The specific sexual act and the role of the infected partner also contribute to per-contact risk of HIV infection. For example, penile–anal intercourse poses a greater risk for HIV transmission than penile–vaginal intercourse.<sup>4</sup> The receptive role, whether anal or vaginal, also carries greatest risk.<sup>4</sup> A 2009 meta-analysis calculated a per-act risk of 0.04% in female-to-male transmission and 0.08% in male-to-female transmission in high-income countries.<sup>7</sup> The pooled estimate of infectivity per act of receptive anal intercourse was significantly higher at 1.7%. **Table 1** summarizes the per-act transmission risk of HIV based on sexual act according to

Transmission Mode	Per-Act Risk of HIV Transmission
Receptive anal intercourse	1.7%
High-income countries	
Female to male	0.04%
Male to female	0.08%
Low-income countries	
Female to male	0.38%
Male to female	0.38%

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