

Anti-HIV vaginal ring can prevent virus transmission: animal study

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Population Council scientists have found that a vaginal ring releasing an anti-HIV drug can prevent the transmission of SHIV in macaques. This study provides the first efficacy data on the delivery of a microbicide from a vaginal ring, and indicates strong potential for the success of such rings in women. Microbicides are compounds that can be applied inside the vagina or rectum to protect against sexually transmitted infections (STIs), including HIV.

"This proof-of-concept study confirms that the investment in vaginal rings as a delivery system for [HIV prevention](#) is paying off," said Naomi Rutenberg, vice president and director of the Population Council's HIV and AIDS Program. "Our findings show that rings can deliver an anti-[HIV drug](#) to prevent infection."

In this study, Council scientists examined whether vaginal rings containing MIV-150, a proprietary non-nucleoside reverse transcriptase inhibitor, could prevent the transmission of immunodeficiency [virus](#). Macaques received either MIV-150 vaginal rings or placebo vaginal rings and then were exposed to a single dose of SHIV, a virus combining genes from HIV and SIV (the monkey version of HIV). Testing drugs in animals is important to ensure the highest level of safety and build the evidence base for potential efficacy in humans.

The macaques received MIV-150 vaginal rings made from ethylene vinyl acetate (EVA) either 2 weeks or 24 hours before exposure to SHIV. The rings were removed either immediately before or 2 weeks after exposure

to SHIV. The timing of ring insertion relative to virus exposure was varied in order to test which would provide better protection: continued presence of drug in the tissue over time or a high rate of drug release that occurs immediately after ring insertion.

MIV-150 EVA rings provided highly significant protection whether inserted 2 weeks or 24 hours before virus exposure. Two of 17 macaques with MIV-150 EVA rings became infected, compared to 11 of 16 with placebo rings, representing 83% protection from the virus ($p=0.0013$). However, the protection was lost when rings were removed just prior to virus exposure: in that scenario, 4 of 7 monkeys were infected, representing 16% protection.

"We were surprised that the rings had to remain in place after exposure to be effective," said Tom Zydowsky, lead scientist and senior co-author on the study. "In previous studies of a Population Council gel containing MIV-150 and another drug, we found that the gel provided protection when applied 24 hours before virus challenge, but was less effective when applied only after virus challenge. We thought that the ring used in this study might only need to be present before virus challenge. We found that it is critical for the ring to also be present after exposure to the virus."

The [vaginal ring](#) delivery system may address one hurdle that has hindered some candidate microbicides in gel form: ensuring that users adhere to the recommended dosing regimen. With a ring, women would not have to remember to use the product on a daily or coitally-dependent basis. Ultimately, the Population Council is working towards a ring that women can insert and leave in place for up to three months, which may be preferable and easier for some women to use and more effective in actual use than a gel.

"This study not only provides proof-of-concept for rings but it also

expands potential [microbicide](#) options by giving us exciting new data on the efficacy of the anti-retroviral MIV-150. As we learned here, MIV-150 is highly effective at preventing infection when released from a ring," added Melissa Robbiani, Population Council Director of Biomedical HIV Research and a lead researcher and senior co-author on the study.

In previous research, Population Council scientists found that adding zinc acetate, a broad-spectrum antiviral agent, to a MIV-150 vaginal gel significantly broadened its protection to combat STIs like HSV-2 in addition to exhibiting increased activity against HIV. These findings also suggest that when used in combination with zinc acetate, the dose of MIV-150 can be lowered and still provide effective HIV protection for women. The Council is already testing rings that combine lower doses of MIV-150 with zinc acetate. Loading vaginal rings with additional compounds could eventually lead to an affordable vaginal ring that prevents multiple STIs—such as [HIV](#), HPV, and HSV-2—as well as unplanned pregnancy.

Provided by Population Council

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