

IMPACT OF THE LEVONORGESTREL INTRAUTERINE SYSTEM ON DIFFUSION OF HIV TYPE 1 WITHIN CERVICOVAGINAL MUCUS

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The World Health Organization estimated that by the end of 2013 infected approximately 35 million people worldwide were infected with HIV. In certain countries, women accounted for the majority of newly acquired infections – and roughly 140 million women worldwide utilized some form of hormonal contraception. Unfortunately, many studies also suggest that hormonal contraceptives increase the likelihood of becoming infected with HIV or transmitting HIV to others. Since the HIV virus must penetrate several layers of the male and female genital tract in order for transmission to occur, laboratory studies evaluating how the HIV virus interacts with these layers might help explain whether hormones change rates of infection.

The Levonorgestrel-Intrauterine System (Mirena, LNG-IUS) is one of the most effective and popular forms of contraception in the United States. The LNG-IUS contains a potent hormone believed to prevent pregnancy by thickening mucus within the cervix and vagina. Since the LNG-IUS exerts contraceptive impact at the level of cervical mucus, any study evaluating how the device impacts the interaction of mucus with HIV virus might help explain whether the device could also alter rates of HIV infection. Investigators from Northwestern University's Department of OBGYN and Hope Virology Laboratory have now completed an investigation evaluating this interaction.

Investigators obtained small amounts of cervical mucus from women requesting placement of the LNG-IUS system. To do so, they utilized a narrow plastic straw that aspirated mucus before placement of the device and three months later when the patient returned to the clinic. Laboratory technician's mixed mucus with fluorescently labeled HIV particles and control beads. The movement of viral particles and beads were monitored using an ultra-sensitive camera mounted on a microscope. Investigators measured the "mean square displacement of virus", a measure of viral movement, and compared movement among the group of women before and after they had undergone IUD placement. Users of the LNG-IUS demonstrated significantly slower movement of HIV virus following placement of the device.

The current study has many limitations. Investigators encountered difficulty imaging many mucus specimens due to small amounts of blood in the specimens or the presence of a form of vaginal inflammation known as bacterial vaginosis. Investigators were also less able to image samples following initiation of the LNG-IUS than preceding initiation of the LNG-IUS leading to a smaller group of women imaged at 3 months. Thickening of mucus induced by the LNG-IUS itself might have contributed to difficulty imaging post LNG-IUS specimens. Finally, since cervical mucus represents only one of several modifiable barriers to HIV transmission study findings about HIV movement cannot yet be generalized to the larger issue of HIV transmission.

This is the first study to reveal a change in HIV viral movement in cervical mucus associated with use of the LNG-IUS. Studies of other progestins demonstrate an increase in viral motility. Future studies should investigate HIV movement among women using all varieties of hormonal contraceptives. In the

meantime, clinicians might consider results from this and similar trials when prescribing contraceptives to at risk populations. If contraceptive hormones such as depo medroxyprogesterone acetate increase the risk of HIV, then IUDs and other agents less dependent on systemic hormone level might offer an alternative means of preventing pregnancy without increasing HIV risk. Some, such as the LNG-IUS, might even offer an opportunity to help reduce the risk of HIV transmission.