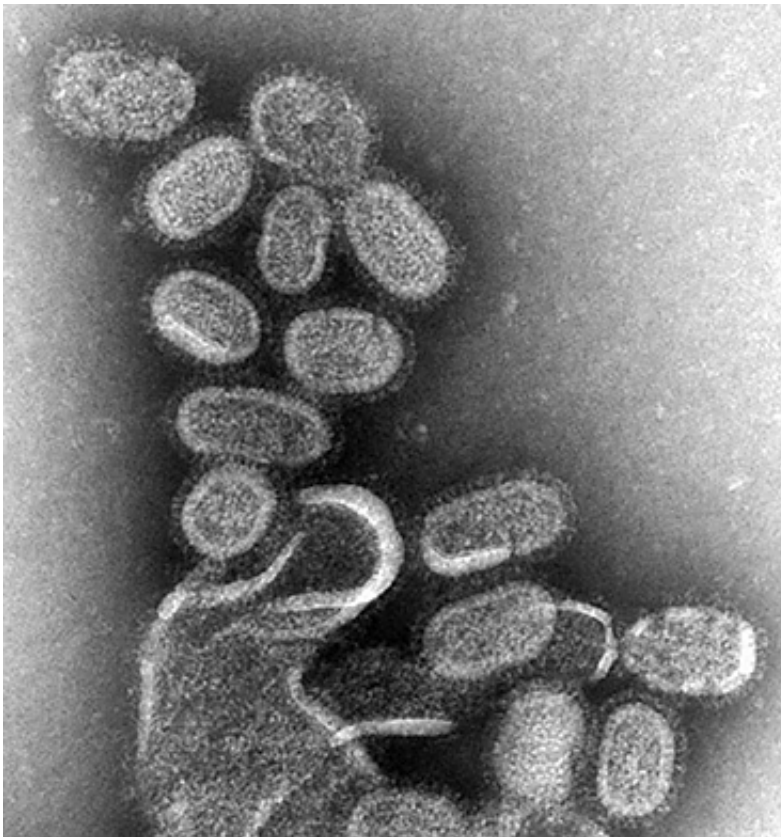


# Female sex hormone progesterone may protect women from worst effects of the flu

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Electron microscopy of influenza virus. Credit: CDC

In mouse studies, researchers from the Johns Hopkins Bloomberg School of Public Health have found that progesterone – a female sex hormone contained in most forms of hormone-based birth control – appears to stave off the worst effects of influenza infection and, in an unexpected

finding, help damaged lung cells to heal more quickly.

The findings, published Sept. 15 in *PLOS Pathogens*, suggest that sex hormones have an effect far beyond the reproductive system and that progesterone may one day be a viable flu treatment for women.

The World Health Organization reports that more than 100 million young adult women around the world are on progesterone-based contraception. And women of reproductive age are twice as likely than men to suffer from complications related to the influenza virus.

"Despite the staggering number of women who take this kind of birth control, very few studies are out there that evaluate the impact of contraceptives on how the body responds to infections beyond sexually-transmitted diseases," says study leader Sabra L. Klein, PhD, an associate professor in the Bloomberg School's Department of Molecular Microbiology and Immunology. "Understanding the role that progesterone appears to play in repairing [lung cells](#) could really be important for women's health. When women go on birth control, they don't generally think about the health implications beyond stopping ovulation and it's important to consider them."

The World Health Organization (WHO) has already listed hormonal contraceptives as an essential medication because of the profound benefits these compounds can have on women's health by widening the interval between pregnancies, including decreased rates of maternal mortality and improved outcomes for babies and children.

For their research, Klein and her colleagues placed progesterone implants in [female mice](#) and left other mice, also female, without. The mice were then infected with influenza A virus. Both sets of mice became ill, but those which had the implants had less pulmonary inflammation, better lung function and saw the damage to their lung cells

repaired more quickly.

The researchers found that progesterone was protective against the more serious effects of the flu by increasing the production of a protein called amphiregulin by the cells lining the lungs. When the researchers bred mice that were depleted of amphiregulin, the protective effects of progesterone disappeared as well. Klein says she was not surprised that progesterone lessened the inflammation and damage associated with the flu. What she didn't expect was to find that progesterone also helped induce repair.

When female mice (and possibly humans) get sick with the flu, their natural levels of progesterone fall. Women on hormonal contraceptives – be it a birth control pill, intrauterine device (IUD) or injection – get a steadier level of progesterone which overrides what the ovaries make naturally or what the virus takes away during infection.

Klein says there is no scientific data to date showing whether progesterone in humans has any relationship to flu severity since no researchers have asked those questions. Building on this research, Klein says researchers at the Johns Hopkins Center of Excellence for Influenza Research and Surveillance doing flu surveillance have added questions about specific forms of [birth control](#) to their questionnaires so they can get a better idea of how this protective effect may work in humans.

The mice in the original study were given actual progesterone and not a synthetic form of the hormone, which is what is in contraception. More recently, as part of their ongoing research, Klein and her team gave synthetic progesterone to [mice](#) and found a similar effect.

Going forward, Klein says, she and her colleagues are studying the precise mechanism for how [progesterone](#) increases the concentration of amphiregulin in the lungs.

"We really want to understand from a therapeutic sense how this could potentially work in humans to keep women from experiencing complications from the flu," Klein says.

**More information:** "Progesterone-Based Therapy Protects Against Influenza by Promoting Lung Repair and Recovery in Females" *PLOS Pathogens*, 2016. [journals.plos.org/plospathogen...journal.ppat.1005840](https://journals.plos.org/plospathogen/article/doi/10.1371/journal.ppat.1005840)

Provided by Johns Hopkins University Bloomberg School of Public Health

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