Women may have better flu defenses

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The female sex hormone estrogen has anti-viral effects against the influenza A virus, commonly known as the flu, a new study in *American Journal of Physiology—Lung Cellular and Molecular Physiology* reports.

A virus infects and causes sickness by entering a cell and making copies of itself inside the host cell. When released from infected cells, the virus can spread through the body and between people. How much a virus has replicated determines its severity. Less replication of the virus means the infected person may experience less disease or is less likely to spread the disease to someone else, says Sabra Klein, PhD, of Johns Hopkins University and lead investigator of the study.

To examine how estrogen affected the flu virus's ability to replicate, the research team gathered nasal cells—the cell type that the flu virus primarily infects—from male and female donors. The researchers exposed the cell cultures to the virus, estrogen, the environmental estrogen bisphenol A and selective estrogen receptor modulators (SERM), which are compounds that act like estrogen that are used for hormone therapy.

The researchers found that estrogen, SERM compound raloxifene and bisphenol A reduced flu virus replication in nasal cells from women but not men. They also observed that the estrogens initiated their antiviral effects through estrogen receptor beta. Receptors are protein structures that molecules bind with to induce cells to respond.

According to Klein, "Other studies have shown that estrogens have antiviral properties against HIV, Ebola and hepatitis viruses. What makes our study unique is two-fold. First, we conducted our study using primary cells directly isolated from patients, allowing us to directly identify the sex-specific effect of estrogens. Second, this is the first study to identify the estrogen receptor responsible for the antiviral effects of estrogens, bringing us closer to understanding the mechanisms mediating this conserved antiviral effect of estrogens."

The findings in this new study support earlier evidence from studies in animals that showed protective effects of estrogen against the flu.

"Because estrogen levels cycle in premenopausal women, it may be difficult to see this protective effect in the general population," Klein notes. "But, premenopausal women on certain kinds of birth control or post-menopausal women on hormone replacement may be better protected during seasonal influenza epidemics," she says. "We see clinical potential in the finding that therapeutic estrogens that are used for treating infertility and menopause may also protect against the flu."

More information: The U.S. Centers for Disease Control and Prevention explains how to protect against the flu.

Jackye Peretz et al. Estrogenic compounds reduce influenza A virus replication in primary human nasal epithelial cells derived from female, but not male, donors, *American Journal of Physiology - Lung Cellular and Molecular Physiology* (2015). DOI: 10.1152/ajplung.00398.2015