

Exercise advantages of estrogen in rodent studies

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Experts in sex as a biological variable are uncovering the role of estrogen in exercise. The researchers will present their findings virtually at the American Physiological Society's (APS) [New Trends in Sex and Gender](#)

[Medicine](#) conference.

In an effort to uncover the mechanisms that prompt individuals to exercise, researchers from Des Moines University in Iowa studied rats that were given continuous access to a running wheel. After a three-week training program, the rats "dramatically increased running activity" and the researchers "uncovered a wide range of individual differences in running behavior."

Compared to males, [female rats](#) showed "significantly higher levels" of daily running activity. Researchers also observed a "peak-valley pattern" in female activity. This pattern followed the fluctuations of the rats' estrous cycle.

Female rats without ovaries did not follow this peak-valley pattern. They also ran less overall, a phenomenon that reversed with estrogen supplementation.

The researchers conclude that estrogen's natural fluctuations account for the different exercise activity between males and females and that "individual differences in estrogen signaling" accounts for the "heterogeneity of exercise engagement."

Estrogen, nitric oxide and microbiome affect exercise capacity in mice

New research into sex differences in [exercise capacity](#) in mice identified three mechanisms—estrogen, [nitric oxide](#) and certain bacteria in the gut—that give female mice an advantage.

- Female mice with ovaries demonstrated greater maximum exercise capacity, peak oxygen consumption and peak energy

expenditure when compared to age-matched males. Females without ovaries did not show these distinctions. Likewise, males treated with estrogen for four weeks showed improved exercise capacity.

- Similarly, activity of enzymes that stimulate nitric oxide production was also elevated in female mice with ovaries and was not elevated in female mice without ovaries. The same enzymes also showed an 81% increase in males treated with estrogen. Treatment with an inhibitor of these enzymes eliminated the enhanced capacity in both females and estrogen-treated males.
- Muribaculaceae, a family of bacteria known to promote exercise tolerance, appear more frequently in the microbiome of exercising female mice, but less so in those who lack ovaries.

Despite these potential benefits of estrogen, however, the researchers caution that it may be premature to recommend the use of the hormone to enhance exercise capacity. "Estrogen can lead to [beneficial effects](#) but it also has detrimental effects including increased risk of [[deep vein thrombosis](#)] and [[coronary artery disease](#)]," advised Marko Oydanich, a [medical student](#) at Rutgers New Jersey Medical School and first author of the study.

Provided by American Physiological Society

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