

Time of day and a patient's sex may alter the effectiveness of blood pressure medication

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New research from a team based at the University of Waterloo suggests that the time of day and a patient's sex may alter the effectiveness of certain blood pressure medications.

Biological sex and the body's [circadian clock](#) are critical factors in managing [blood pressure](#). The circadian clock is a natural, internal process that regulates things like the sleep-wake cycle and repeats roughly every 24 hours. Among its many other functions, the circadian clock also regulates kidney function. The kidneys play a crucial part in regulating blood pressure by managing fluid and electrolyte levels in the body.

"One important class of blood pressure medication is diuretics, sometimes called water pills," said Anita Layton, a professor of Applied Mathematics at Waterloo and the study's corresponding author.

"Diuretics lower blood pressure by targeting kidney function to increase the amount of urine the body excretes. If they don't work correctly, they can negatively impact blood pressure."

Layton's team used mathematical models to simulate [kidney function](#) in male and female mice to assess the effectiveness of various kinds of diuretic drugs: [loop diuretics](#), thiazide diuretics, and potassium-sparing diuretics.

First, the researchers simulated active—nighttime for a nocturnal animal—and inactive—daytime—cycles of each mouse's [circadian rhythms](#). Then they measured the predicted urine output and sodium excretion for each kind of medication, at each time, in male and female mice. They found that, for each category of diuretic, sex and [time of day](#) impacted drug effectiveness differently.

Even though humans typically have the opposite circadian clock—we are active during the day and inactive at night—the results suggest that people can make their blood pressure treatment plans more effective by choosing the right time to take their medication.

"Chronotherapy, which is the tailoring of drug administration to match

the body's circadian rhythms, can play a major role in improving modern personalized medicine," Layton said.

The study, Influence of administration time and sex on natriuretic, diuretic, and kaliuretic effects of diuretics, is forthcoming from the *American Journal of Physiology-Renal Physiology*.

More information: Pritha Dutta et al, Influence of administration time and sex on natriuretic, diuretic, and kaliuretic effects of diuretics, *American Journal of Physiology-Renal Physiology* (2023). [DOI: 10.1152/ajprenal.00296.2022](https://doi.org/10.1152/ajprenal.00296.2022)

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