

# Blood pressure's internally driven daily rhythm unlikely to be linked to morning heart attacks

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The internally-driven daily cycle of blood pressure changes doesn't appear to be linked to the known increase in morning heart attacks, according to a study in *Circulation Research: Journal of the American Heart Association*.

Researchers sought to identify the role of the internal human [body clock](#) in the daily rise and fall in blood pressure. In the study, three groups of volunteers showed an internal daily blood pressure variation with a peak at around 9 p.m. — independent of changes in activity and other behavioral influences that can affect blood pressure.

Increased blood pressure is a major risk factor for adverse cardiovascular events. However, the study revealed that the internal blood pressure cycle resulted in the lowest blood pressure occurring in the late morning. This unexpected finding indicates that blood pressure's internal circadian rhythm — a cycle of about 24 hours that occurs in many biological processes — is unlikely to be linked to the well-documented morning peak in heart events or strokes, said Steven A. Shea, Ph.D., lead author of the study and associate professor of medicine at Harvard Medical School in Boston, Mass.

"We used three complementary experimental protocols and three different groups and found essentially the same results," Shea said. "That means we're dealing with something very robust."

Shea and his colleagues randomized 28 volunteers without hypertension to three multi-day in-laboratory protocols. Before the study, participants maintained a regular sleep-wake schedule at home (16 hours of scheduled wakefulness with eight hours of scheduled sleep) for two to three weeks to stabilize circadian rhythms. They then underwent two baseline days and nights in the laboratory with the same sleep-wake schedule as at home, followed by a prolonged laboratory protocol designed to separate internal circadian effects from behavioral and environmental effects on blood pressure and other physiological variables. These controlled behavioral and environmental conditions included activity, posture, meals, sleep, room temperature, and light. The researchers measured core body temperature to track circadian time.

The three protocols, carried out in dim light to avoid resetting any of the body's circadian rhythms, included:

- 38-hour "constant routine," with continuous wakefulness and constant body posture.
- 196-hour "forced desynchrony" (forcing a sleep/wake cycle to conflict with participants' normal pattern) consisting of recurring 28-hour sleep/wake cycles with 18 hours, 40 minutes awake and 9 hours, 20 minutes asleep.
- 240-hour "forced desynchrony" with twelve recurring 20-hour sleep/wake cycles.

All three protocols revealed almost identical systolic and diastolic circadian rhythms, which were unrelated to other internal rhythms that are known to influence cardiovascular events, such as increases in sympathetic nervous system activity.

The reason for the peak in heart attacks and strokes in morning hours remains unexplained by these findings, but could certainly be related to the activities that normally occur on a regular daily basis. "For example, other recent work by our group indicates that the body clock interacts with behaviors, such as exercise, to cause an exaggerated increase in cardiovascular risk markers during the biological morning," adds Frank A. Scheer, Ph.D., co-author of the study and assistant professor of medicine at Harvard Medical School. It is possible that the evening peak in the internal circadian [blood pressure](#) cycle may help to explain a second, albeit less prominent increase in heart attacks that occurs in the evening, the researchers said.

"We now need to study people with different vulnerabilities and risk factors for cardiovascular disease," Shea said. "So far, we have studied very healthy people who don't have hypertension or the build-up of arterial plaques that could bring them closer to the theoretical threshold for precipitating an adverse cardiac event."

Provided by American Heart Association

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