Are hormones from the heart responsible for high nighttime blood pressure?

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Investigations by researchers at UAB reveal the existence of a day-night rhythm of heart hormones, and how the disturbance of this rhythm could contribute to a high risk of high blood pressure and poor cardiovascular health in obese individuals. Credit: University of Alabama at Birmingham

A series of studies recently published in the *Journal of the American College of Cardiology* by University of Alabama at Birmingham researchers describes the reasons behind low levels of natriuretic

peptides in obese individuals. NPs are beneficial hormones produced by the heart that are responsible for the regulation of blood pressure and the overall cardiovascular and metabolic health of humans. This study also addresses how the disturbance of an individual's day-night, or diurnal, rhythm of these hormones contributes to poor cardiovascular health in obese individuals.

Obesity is associated with a higher risk of high blood pressure and poor cardiovascular outcomes. High blood pressure at nighttime is seen commonly in obese individuals, which can contribute to outcomes such as stroke, heart failure, heart attack and cardiac death. The reasons for the impairment of this day-night blood pressure rhythm are not well understood, but scientists believe that NPs could be a reason behind this.

"All the hormones in the human body have a day-night rhythm," said Vibhu Parcha, M.D., a clinical research fellow in the Division of Cardiovascular Disease and the first author of both the studies. "It has been hypothesized the NP hormones should also have this rhythm, but this had not yet been demonstrated in humans. Our clinical trial assessed the 24-hour cycle of the NP hormones and compared it to the 24-hour cycle of blood pressure. We also studied how these cycles differ between lean and obese individuals and studied the reasoning behind why obese individuals experience lower levels of NPs."

After a rigorous clinical trial of healthy individuals, researchers found that NP hormones have a day-night rhythm with higher levels in the afternoon and lower levels at nighttime, which is similar to the 24-hour cycle of blood pressure. However, researchers found that the relationship between NPs and blood pressure does not function the same way in obese individuals, leading to higher nighttime blood pressure, poor cardiovascular health and a higher risk of poor cardiovascular outcomes. The low production of NPs combined with a relatively higher

elimination of NPs from an obese individual's system leads to low circulation levels of these beneficial hormones, which may be the reason behind the NP deficiency.

"This is the first time we have seen that NPs, like other hormones, have a 24-hour rhythm," said senior author Pankaj Arora, M.D., a physician-scientist in UAB's Division of Cardiovascular Disease. "These studies give us a better understanding of NPs and of the reasoning behind the NP deficiency in obese individuals. We now have an FDA-approved medication (LCZ696) that improves circulating NP levels. This medication is considered a first-line treatment for heart failure and may be used to increase NP levels."

Arora added that this medication could specifically target NPs and blood pressure if given at the right time of day and could control hypertension with precision. Scientists believe that these findings encourage using a physiologically driven precision chronopharmacotherapy approach to improve the day-night blood pressure profile in obese individuals.

More information: Vibhu Parcha et al, Chronobiology of Natriuretic Peptides and Blood Pressure in Lean and Obese Individuals, *Journal of the American College of Cardiology* (2021). DOI: 10.1016/j.jacc.2021.03.291

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