

Smoking may impair body's blood pressure autocorrect system

13 June 2019



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Smokers may be at a higher risk for developing hypertension, and an overactive response to normal drops in blood pressure may help explain why, according to researchers.

"The [human body](#) has a buffering system that continuously monitors and maintains a healthy [blood pressure](#)," said Lawrence Sinoway, director of the Penn State Clinical and Translational Science Institute. "If blood [pressure](#) drops, a response called muscle sympathetic nerve activity (MSNA) is triggered to bring blood pressure back up to [normal levels](#)."

An additional system—called the baroreflex—helps correct if blood pressure gets too high, he added.

According to Sinoway, the study found that after a burst of MSNA, the rise in blood pressure in a chronic smoker was about twice as great as in a non-smoker, pushing blood pressure to unhealthy levels. The researchers suspect that impairment of baroreflex may be why.

"When the sympathetic nervous system fires, like with MSNA, your blood pressure rises and then a series of things happen to buffer that increase, to try to attenuate it," Sinoway said. "We think that in [smokers](#), that buffering—the baroreflex—is impaired."

Jian Cui, associate professor of medicine, said the results suggest that this impairment may be connected to hypertension.

"The greater rise in blood pressure in response to MSNA may contribute to a higher resting blood pressure level in smokers without hypertension," Cui said. "It's possible that this higher response to MSNA could also contribute to the eventual development of hypertension."

The researchers said that while previous research has found a link between chronic smokers and higher levels of MSNA bursts, less was known about what happened to blood pressure after these bursts. Additionally, Sinoway said other studies examined the effects of acute smoking—a single session of being exposed to [cigarette smoke](#)—on non-smokers, instead of habitual smokers.

For the study, the researchers recruited 60 participants—18 smokers and 42 non-smokers. None of the participants had hypertension. The smokers reported smoking an average of 17 cigarettes a day over a period of about 13 years.

To measure MSNA, the researchers inserted an electrode into the peroneal nerve, which sits below the kneecap, of each participant. Additionally, they measured heart rate, diastolic and systolic blood pressure, and mean arterial pressure at the brachial artery in the upper arm.

After analyzing the data, the researchers found no difference in [systolic blood pressure](#) between smokers and non-smokers. However, [diastolic blood pressure](#), mean arterial pressure and heart rate were significantly higher in smokers. Smokers

also had higher levels of MSNA. In addition, resting [heart rate](#) was significantly higher in smokers.

Cui said the findings, recently published in the *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology*, give further evidence of the harmfulness of smoking.

"Our study reveals another mechanism by which habitual smoking may contribute to the development of hypertension," Cui said. "Further studies are needed to examine if quitting smoking can decrease this accentuated response."

In the future, Sinoway said he and the other researchers will continue to investigate the link between smoking and high blood pressure.

"We're hoping to better understand just how much cigarette [smoking](#) contributes to the development of hypertension," Sinoway said. "Then, we can try to understand if there are things we can do to intervene and prevent chronic smokers from developing this condition."

More information: Jian Cui et al, Habitual Cigarette Smoking Raises Pressor Responses to Spontaneous Bursts of Muscle Sympathetic Nerve Activity, *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology* (2019). [DOI: 10.1152/ajpregu.00293.2018](#)

Provided by Pennsylvania State University

APA citation: Smoking may impair body's blood pressure autocorrect system (2019, June 13) retrieved 25 January 2021 from <https://medicalxpress.com/news/2019-06-impair-body-blood-pressure-autocorrect.html>

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