

Mainz scientists identify enzyme responsible for vascular damage caused by aircraft noise

New study of the cardiology of the University Medical Center Mainz continues to show that night-time noise is particularly harmful to vessels and brain

MAINZ, RHINELAND PALATINUM, GERMANY, June 15, 2018 /EINPresswire.com/ --) In a recent study, scientists at the Department of Cardiology of University Medical Center Mainz have identified an enzyme responsible for aircraft-related vascular damage. They were also able to show that night-time noise has a particularly harmful effect and therefore demand that night-time sleep be protected from noise. With the current study, the scientists around Univ.-Prof. Dr. Thomas Münzel, Director of Cardiology I at the Department of Cardiology, and Univ.-Prof. Dr. Andreas Daiber, Head of Molecular Cardiology at the Department of Cardiology, consistently pursue her research in the field of noise research and can announce another breakthrough. The new study will be published in the European Heart Journal, the world's most renowned cardiology journal.

Aircraft noise in the long term leads to an increased development of cardiovascular diseases – as a series of precursor studies has now shown unequivocally. In 2013, the research group of Professor Münzel succeeded in demonstrating that simulated nocturnal noise increases the stress hormone epinephrine, reduces sleep quality and damages the vascular system, called [endothelial dysfunction](#). Further studies on a newly developed animal model showed last year that aircraft noise leads to a significant increase in stress hormones, a vascular dysfunction, increased [oxidative stress](#) and inflammatory processes in the vessels as well as a marked change in the expression of genes in the vessel wall.

Professors Münzel and Daiber comment: „With this new study, we can demonstrate for the first time that „night-time noise“ (during the sleep phase of the mice) and not noise during the waking phase is responsible for vascular dysfunction. We can also show that the elimination of the enzyme ‘phagocytic NADPH oxidase’, which is located mainly in inflammatory cells, completely avoids aircraft noise-induced negative effects on vessels and brain.” This enzyme was also in the focus of the scientists in the last study. The current investigations finally prove its central role and provide also proof that the negative aircraft noise effects are mediated by this enzyme.

With the present studies, the scientists also examined the effects of aircraft noise on the brain. Here, the focus was on neuronal nitric oxide (NO) synthase, an important enzyme in the brain. Responsible for learning and memory, this enzyme is down-regulated by aircraft noise and its function is impaired. This new finding may explain the described cognitive developmental disorders in children after exposure to aircraft noise.”

Another finding is that the transcription factor FoxO3 plays a central role in noise-induced vascular and brain damage: The consequence of the observed downregulation of this transcription factor by „night-time noise“ leads to a defective gene expression network that controls cellular events as a function of circadian rhythm. Disturbance of the circadian rhythm can lead to sleep disorders and subsequently to more cardiovascular, mental and metabolic disorders. To this end, the scientists came to this recognition through extensive genetic analysis by means of „Next Generation Sequencing (NGS)“ and by demonstrating a prevention of the aforementioned vascular damage by

treatment with the FoxO3 activator Bepridil.

According to the study initiators, these results represent a further breakthrough in noise research. "With our findings, especially with regard to night-time noise, we can now explain clinical results, e.g. according to the so-called HYENA study, where night-time noise in particular can trigger high blood pressure. The finding that the elimination of the enzyme „phagocytic NADPH oxidase“ completely prevents vascular damage may enable us to develop drug strategies to reduce the negative effects of aircraft noise for our body," both scientists comment.

Both authors conclude from their findings that it must be an important goal to protect the night's sleep from noise and in particular to implement the legally defined night's sleep from 22 o'clock in the evening to 6 o'clock in the morning.

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„Crucial role for Nox2 and sleep deprivation in aircraft noise-induced vascular and cerebral oxidative stress, inflammation and gene regulation“

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