Temporal variation of transportation noise during sleep impacts on glucose metabolism

Laurie Thiesse[1]; Franziska Rudzik[1]; Reto Pieren[2]; Jean Marc Wunderli[2]; Karine Spiegel[3]; Rachel Leproult[4]; Maria Foraster[5]; Harris Héritier[5]; Ikenna C. Eze[5]; Danielle Vienneau[5]; Mark Brink[6]; Nicole Probst-Hensch[5]; Martin Röösli[5]; Christian Cajochen[1]

[1] Centre for Chronobiology, Psychiatric Hospital of the University of Basel
[2] Empa - Swiss Federal Laboratories for Materials Science and Technology, Duebendorf, Switzerland
[3] INSERM U1028 - UMR 5292, Lyon Neuroscience Research Center (CRNL), Team „Integrated Physiology of the Brain Arousal System“
[4] UNI-ULB Neuroscience Institute, Université Libre de Bruxelles (ULB)
[5] Swiss Tropical and Public Health Institute, University of Basel
[6] Swiss Federal Office for the Environment

Corresponding author's e-mail address: laurie.thiesse@upkbs.ch

ABSTRACT

Intermittency ratio (IR) has been proposed as a new metric to reflect short-term temporal variations of noise exposure. As transportation noise is linked to higher risk for incident type 2 diabetes, we investigated the short-term effect of IR on glucose metabolism.

Twenty-three volunteers (age: 24.6±0.7y; BMI: 22.1±0.4; 11 females) participated in a laboratory study starting with a noise-free baseline night followed by four nights with night-time noise scenarios differing in IR (low IR: distant highway, dense traffic vs. high IR: short distance, residential street or railway line) with a constant hourly Leq of 45 dB(A) at the ear of the sleeper. The study ended with a noise-free recovery night.

Glucose levels significantly increased after four nights of nocturnal transportation noise compared to baseline. After one recovery night glucose returned to baseline levels for low IR, but not for high IR.

Four nights of nocturnal traffic noise significantly impaired glucose tolerance in lean young volunteers. We have first evidence that short-term effect of highly intermittent night noise is more deleterious for glucose metabolism than low intermittency.