

## The association of long-term road-traffic noise exposure with the immune response and systematic inflammation

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### ABSTRACT

Long-term exposure to environmental noise has been shown to be associated with cardiometabolic diseases. Noise can induce a stress reaction, but the underlying mechanisms have rarely been studied in association with inflammation and the immune response. We investigated the association of long-term road-traffic noise and different types of immune cells, high sensitivity-C-reactive protein (hs-CRP), and a panel of 30 inflammatory biomarkers. A cross-sectional analysis was performed using data of the population-based KORA FIT study (2018-2019) in the region of Augsburg, Germany. White blood count (WBC), leucocyte subsets and hs-CRP measurements were available for 1,038 city dwellers (53-74y). Blood markers from the OLINK inflammation panel were determined in a subgroup of 306 individuals. Road-traffic noise levels from noise maps were assigned to the participants' residences. We applied linear regression models adjusted for potential confounders. Effect modification was examined by including interaction terms. Road-traffic noise was not associated with hs-CRP (%-change: 0.35 [CI:-3.68;4.55]) and immune cells (e.g. WBC: 0.19 [-0.83;1.22]) per increase of 5 dB(A). Nevertheless, we observed a slight shift in immune cells with a decrease in the percentage of neutrophils, eosinophils, basophils and lymphocytes and an increase in the percentage of monocytes. OLINK inflammatory markers showed associations for CCL19 (0.05 [0.00;0.09]), CCL20 (0.06 [0.01;0.11]), MCP-3 (0.05 [0.01;0.08]) and CXCL1 (-0.07 [-0.13;-0.01]). Age, sex, stress and noise annoyance modified the observed associations, but no clear pattern emerged. Our results indicate that long-term road-traffic noise may induce a complex interplay of several mechanisms associated with inflammation and changes in immune cell concentrations.

Keywords: Environmental Noise, Road Traffic Noise, Inflammation, Immune Response, Biomarkers