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Tracking the effects of air pollution on the brain

Researchers from the IUF – Leibniz Research Institute for Environmental Medicine in Düsseldorf (Germany) showed in collaboration with the Dutch National Institute for Public Health and the Environment (RIVM) in Bilthoven (The Netherlands) and with the Division of Molecular Psychiatry at the University Medical Center Göttingen (Germany) that traffic-related airborne pollutants accelerate the formation of amyloid plaques and enhance motor function impairment in a mouse model of Alzheimer's disease. The corresponding study was recently published in the international journal „Particle and Fibre Toxicology".

Düsseldorf, 13.09.2017. In recent years, there has been growing concern that air pollution has an adverse impact on the brain and thereby may influence the development and progression of age-related diseases such as Alzheimer's disease or other types of dementia. In this regard, in 2009 researchers from the IUF – Leibniz Research Institute for Environmental Medicine in Düsseldorf, Germany, were the first to show an association between long-term exposure to traffic-related particulate matter and mild cognitive impairment in a study of elderly women.[1] Such an impairment is associated with a high risk of progression to Alzheimer's disease. In support of these findings, in a large population based cohort study in Canada, an association was recently found between dementia incidence and living near major roads.[2] However, these and other epidemiological studies do not prove a cause and effect relationship between exposure to air pollution and brain disease.

In 2012, the IUF has therefore initiated the international Leibniz project AIRBAG (AIR pollutants and Brain Aging research Group), led by Dr. Roel Schins (IUF) and Prof. Flemming Cassee (RIVM, The Netherlands). Latest findings from this international research cooperation have now been published in the journal „Particle and Fibre Toxicology". They show that airborne pollutants from diesel vehicles, used as an example for traffic-related air pollution, accelerate the formation of Alzheimer's disease-associated amyloid plaques and enhance motor function impairments in a mouse model of Alzheimer's disease.

„With our toxicological study we are bridging a gap with the existing epidemiological findings. Our results indicate that there is a causal relation between air pollution and diseases of the central nervous system", reports Dr. Roel Schins from IUF. „In the next years, we will conduct additional studies to clarify if the same results can be reproduced in real traffic exposure situations, to address human relevance, to find out which components of the exhaust emissions (particles or gases) cause these adverse effects, to identify the underlying mechanisms and to assess which preventive medical measures could be appropriate", adds Prof. Jean Krutmann, director of IUF.

426 words, 2907 characters

Publication
Hullmann M, Albrecht C, van Berlo D, Gerlofs-Nijland ME, Wahle T, Boots AW, Krutmann J, Cassee FR, Bayer TA, Schins RPF: Diesel engine exhaust accelerates plaque formation in a mouse model of Alzheimer's disease. Part Fibre Toxicol 14:

35, 2017. doi: 10.1186/s12989-017-0213-5
https://particleandfibretoxicology.biomedcentral.com/articles/10.1186/s12989-017-0213-5

Further references
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2.) Chen H, Kwong JC, Copes R, Tu K, Villeneuve PJ, van Donkelaar A, Hystad P, Martin RV, Murray BJ, Jessiman B, Wilton AS, Kopp A, Burnett RT: Living near major roads and the incidence of dementia, Parkinson's disease, and multiple sclerosis: a population-based cohort study. Lancet 389: 718-726, 2017. doi: 10.1016/S0140-6736(16)32399-6

About IUF
The IUF – Leibniz Research Institute for Environmental Medicine investigates the molecular mechanisms through which particles, radiation and environmental chemicals harm human health. The main working areas are environmentally induced aging of the cardiovascular system and the skin as well as disturbances of the nervous and immune system. Through development of novel model systems the IUF contributes to the improvement of risk assessment and the development of novel strategies for the prevention / therapy of environmentally induced health damage.
More information: http://www.iuf-duesseldorf.com
The IUF is part of the Leibniz Association: http://www.leibniz-gemeinschaft.de/en/home

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