Indirect Genotoxicity of Diesel Engine Emission: An in vivo Study Under Controlled Conditions

Authors : Y. Landkocz, P. Gosset, A. Héliot, C. Corbière, C. Vendeville, V. Keravec, S. Billet, A. Verdin, C. Monteil, D. Préterre, J-P. Morin, F. Sichel, T. Douki, P. J. Martin

Abstract : Air Pollution produced by automobile traffic is one of the main sources of pollutants in urban atmosphere and is largely due to exhausts of the diesel engine powered vehicles. The International Agency for Research on Cancer, which is part of the World Health Organization, classified in 2012 diesel engine exhaust as carcinogenic to humans (Group 1), based on sufficient evidence that exposure is associated with an increased risk for lung cancer. Amongst the strategies aimed at limiting exhausts in order to take into consideration the health impact of automobile pollution, filtration of the emissions and use of biofuels are developed, but their toxicological impact is largely unknown. Diesel exhausts are indeed complex mixtures of toxic substances difficult to study from a toxicological point of view, due to both the necessary characterization of the pollutants, sampling difficulties, potential synergy between the compounds and the wide variety of biological effects. Here, we studied the potential indirect genotoxicity of emission of Diesel engines through on-line exposure of rats in inhalation chambers to a subchronic high but realistic dose. Following exposure to standard gasoil +/- rapeseed methyl ester either upstream or downstream of a particle filter or control treatment, rats have been sacrificed and their lungs collected. The following indirect genotoxic parameters have been measured: (i) telomerase activity and telomeres length associated with rTERT and rTERC gene expression by RT-qPCR on frozen lungs, (ii) γH2AX quantification, representing double-strand DNA breaks, by immunohistochemistry on formalin fixed-paraffin embedded (FFPE) lung samples. These preliminary results will be then associated with global cellular response analyzed by pan-genomic microarrays, monitoring of oxidative stress and the quantification of primary DNA lesions in order to identify biological markers associated with a potential pro-carcinogenic response of diesel or biodiesel, with or without filters, in a relevant system of in vivo exposition.

Keywords : diesel exhaust exposed rats, γH2AX, indirect genotoxicity, lung carcinogenicity, telomerase activity, telomeres length
Conference Title : ICT 2015 : International Conference on Toxicology
Conference Location : London, United Kingdom
Conference Dates : February 16-17, 2015