THE EFFECT OF AIRBORNE BRAKE WEAR DEBRIS ON IMMUNE RESPONSE

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Abstract

Particulate air pollution from road traffic represents currently significant environmental issue. Attention is also paid to the “non-exhaust pollution sources” from road traffic, which includes brake wear debris. During every braking of automobiles, the airborne and nonairborne particles are emitted into the environment. The high temperatures and pressures on the friction surfaces initiate chemical and morphological changes of the components of brake pads. Therefore, determination of potential health impact is very important.

Numerous studies clearly demonstrated that particulate matter caused potential adverse effects related to cytotoxicity, oxidative stress, stimulation of proinflammatory factors, and mutagenicity on the cellular level. This study addressed the effect of airborne brake wear particles on immune response. The brake wear particles were generated using an automotive brake dynamometer simulating urban driving conditions. The particles were analyzed by transmission electron microscopy and by Raman microspectroscopy. In vitro human peripheral blood cell model was used to evaluate the effect of airborne brake wear on innate and acquired immune response. The assessment of immunosafety of particles released from brake pads was performed using immune assays: proliferative response of lymphocytes in vitro stimulated with mitogens and phagocytic activity and respiratory burst of leukocytes. The obtained results point to immunotoxicity related to the generated wear debris. It is speculated that nanoparticles present play important role.

Keywords: Brake wear debris, assessment of immunosafety, immune response, lymphocytes, phagocytes

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