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MITIGATION OF $PM_{2.5}$-INDUCED CARDIOVASCULAR DAMAGE BY STATINS AND ACE INHIBITORS

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Particulate matter (PM) is well recognized as the major contributor to the air pollution disease burden. Presently, the data pointing to the direct effects of PM on the cardiovascular health are numerous, but the mitigation strategies are still at the level of reduction of exposure. In the present study, we used a mouse model of real-life $PM_{2.5}$ exposure treated with either a statin (atorvastatin) or an ACE inhibitor (captopril) in order to observe the potentially protective effects of cardiovascular drug treatment on the underlying mechanisms of detrimental, $PM_{2.5}$-induced, cardiovascular effects. Captopril treatment mitigated the $PM_{2.5}$-induced blood pressure while both drugs reduced selected markers of oxidative stress in the vasculature and heart. Both drugs were successful in mitigating the vascular oxidative stress by reducing the activation of the NADPH oxidase enzyme. In addition, both drugs were able to reverse the $PM_{2.5}$-induced increase in vascular endothelin-1. The treatment also reduced the level of 3-NT positive proteins in the lung and mitigated the effects on dysregulated eNOS expression. Drugs did not mitigate the inflammatory response in the lung and in circulation with only captopril reducing the pulmonary IL-6, but not CD68 expression. In summary, ACE inhibitors can potentially mitigate the effects of $PM_{2.5}$ on the vascular function and oxidative stress by lowering blood pressure and statins have a known antioxidant effect, e.g. via inhibition of NADPH oxidase. Our present data provide novel insights into possible mitigation strategies for $PM_{2.5}$-induced cardiovascular disease. Since statins and ACE inhibitors represent first-line therapies for cardiovascular disease, CVD patients, e.g. with coronary artery disease, ischemic heart disease, and hypertension representing highly vulnerable groups for air pollution health effects, may benefit from pre-established therapies with these drugs to prevent additive cardiovascular damage by $PM_{2.5}$ exposure.