Acute Cardiovascular Effects of Biofuel Exhaust Exposure

Jon Unosson

Akademisk avhandling

som med vederbörligt tillstånd av Rektor vid Umeå universitet för avläggande av medicine doktorsexamen framläggs till offentligt försvar i Sal D, 9 trappor, byggnad 1D, Norrlands Universitetssjukhus fredagen den 12 december, kl. 09:00.
Avhandlingen kommer att försvaras på engelska.

Fakultetsopponent: Dr. Matthew J Campen
Department of Pharmacological Sciences, University of New Mexico, Albuquerque, USA
Abstract
Particulate matter air pollution is a global health problem estimated to contribute to millions of premature deaths, mainly due to cardiovascular disease. Small particles derived from combustion have proved most dangerous. The cardiovascular effects of our oldest anthropogenic air pollution, wood smoke, as well as novel pollutants, such as biodiesel exhaust, are unknown.

In four separate studies we investigated the acute cardiovascular effects of wood smoke exposure and biodiesel exhaust exposure. We hypothesized that a sooty wood smoke would elicit similar adverse effects as have previously been demonstrated following petrodiesel exhaust exposure, including increased central arterial stiffness, vasomotor dysfunction, and increased thrombus formation. We also hypothesized that replacing petrodiesel with a 30% rapeseed biodiesel blend or pure rapeseed biodiesel would lessen the well known acute adverse cardiovascular effects following exhaust exposure.

We found that a sooty wood smoke increased central arterial stiffness and decreased heart rate variability in healthy volunteers, but it did not affect vasomotor function or thrombus formation in male fire fighters. Replacing petrodiesel with rapeseed methyl ester (RME) biodiesel resulted in equal acute adverse cardiovascular effects following exhaust exposure, despite marked differences in the exhaust composition.

Keywords
Air pollution, wood smoke, diesel exhaust, biodiesel exhaust, cardiovascular, endothelial dysfunction, central arterial stiffness, thrombosis, heart rate variability.