More toxicity in canola-based biodiesel

November 4 2014, by Rob Payne

"They also have a higher specific surface area and thus higher capacity to absorb toxic compounds, and are able to penetrate into the respiratory system, to be retained in the lungs and penetrate into the cardiovascular system," he says. Credit: Jenn Durfey

Exhaust from pure canola oil biodiesel is more lethal for human epithelial cells than that from traditional diesel, new research contends.

Epithelial cells, which are found in the lining of the airways and lungs, provide the body's first line of defence against viruses and particles capable of invading the body.

The research found that the ultrafine size of fuel exhaust particles from refined and blended canola oil could lead to respiratory health problems.

The researchers examined how epithelial cells react to diluted exhaust from four fuels: standard pump-diesel (ULSD), unprocessed canola oil, 100 per cent canola biodiesel (B100) and a 20/80 per cent blend of canola oil and ULSD (B20).

"Different fuel types, combusted under identical conditions, produced significantly different amounts of important exhaust gases and different particle characteristics," Telethon Kids Institute Associate Professor Alexander Larcombe says.

"Pure canola oil exhaust contained significantly more carbon monoxide (CO), carbon dioxide (CO2), nitrogen dioxide (NO2) and sulphur dioxide (SO2) than the others and the lowest amount of nitric oxide (NO).

"[Epithelial] cells exposed to pure canola oil exhaust were significantly less viable than cells exposed to any other exhaust 24 hours after exposure."

The particle's physical characteristics, such as distribution size, had an impact while the cell's viability was negatively correlated with CO and strongly correlated with NO.

The study raises a red flag on particle concentrations at the far ends of the size spectrum.

Of the tested fuels, B100 and B20 contained the greatest number of very small particles.

Given that inhalation-related health problems are strongly associated

with ultrafine particles, this could be problematic.

"The smaller particles produced from B20 and B100 combustion are likely to remain suspended in the atmosphere for longer and are therefore more likely to be inhaled," A/Prof Larcombe says.

"They also have a higher specific surface area and thus higher capacity to absorb toxic compounds, and are able to penetrate into the respiratory system, to be retained in the lungs and penetrate into the cardiovascular system."

Also, once inside the body, smaller particles induce a greater inflammatory effect and are less likely to be removed by natural processes.

A 2010 analysis of 700 peer-reviewed studies found causal relationships, though not proof, between exhaust pollution and impaired lung and heart function, including hardening of the arteries.

Provided by Science Network WA