mgr Magdalena Kowalska

Summary of PhD thesis entitled: "Cellular and molecular effects od DEPs nanoparticles from the combustion 1st- and 2nd-generation biodiesel fuels in a Diesel engine"

Global warming is one of the biggest environmental challenges of our time. Yet, it is imperative that the solutions that are chosen to protect the global environment are safe and not introduced at the expense of local environments. Currently biodiesel fuels are only used at low levels throughout Europe (7%), but vision plans has been proposed to increase the shear of biofuels considerably in the near future (20%). A development that is also driven by the need to reduce the dependency of fossil fuel imports. The potential health impact of new fuels and combustion technologies therefore need to be critically assessed before large-scale introduction.

The objective of the PhD thesis was to compare the toxicity of different diesel exhaust particles from combustion of 1st and 2nd generation biodiesel fuels in relation to their physicochemical properties.

Diesel exhaust particles were produced by the 1.3 JTD engine (Euro V stage), fueled with three biodiesel fuels of commercial interest: the 1st generation B7 biodiesel fuel (7% FAME), which is currently used in EU, the 1st generation B20 biodiesel fuel (20% FAME) and the 2nd generation SHB biodiesel fuel (7% FAME and 13% synthetic HVO). Detailed physicochemical characterizations of diesel exhaust particles were performed to investigate how the composition of three types of DEPs affects their biological effects *in vitro*, measured as cellular uptake kinetics, cell death response, total protein content, production of ROS, induction of single and double strand breaks in DNA, induction of oxidative DNA damage and induction of chromosomal damage in BEAS-2B and A549 cells. In addition, the expression of genes regulated during cellular responses to stress and DNA damage was also evaluated to screen for possible molecular mechanisms of toxicity.

The results revealed that different biodiesel blend percentage and biodiesel feedstock led to marked differences in chemical composition of the emitted nanoparticles. The different nanoparticles also displayed statistically significant differences in cytotoxicity and genotoxicity in A549 and BEAS-2B cells. Overall, the results shown that increasing biodiesel blend-concentrations from the current 7% to 20% FAME, or substituting 1st generation FAME biodiesel with 2nd generation HVO biodiesel (at least below 20% blends), affects the *in vitro* toxicity of the emitted nanoparticles.

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