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Michálková, Lenka
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Student: Lenka Michálková MSc.
Supervisor: Prof. Vladimír Setnička, Ph.D.
Supervising Expert: Ing. Jan Sýkora, Ph.D.

The application of nanoparticles (NPs) in various fields, particularly in electronics, optoelectronics, drug delivery and medical diagnostics, has considerably increased over the last decade, alongside with the concern about public health, consumer safety and occupational safety. The possible adverse health effects and physiological response to NPs exposure are not properly described and understood.[1,2] However, it is well known that NPs are able to cross cell barriers, enter cells and interact with subcellular structures. Furthermore, a common response to NPs exposure is the induction of oxidative stress and inflammation.[2–4] The standard safety procedures for monitoring NPs exposure in the workplace are usually insufficient. Therefore, another challenge in this field is to find specific ways to assess the occupational risk of NPs exposure and the possible adverse health effect.

The analysis of key metabolites in body fluids is an important strategy for monitoring the current state of an organism and has been widely used in disease diagnosis.[3,4] Applying a metabolomics strategy in toxicology may help to screen phenotypic changes that have occurred as a result of NPs exposure. Moreover, a comparison of pre- and post-exposure metabolic profiles together with a quantitative description of impaired metabolites based on statistical analysis may help to assess the acute and chronic toxicological effects.[4]

In our study, ^{1}H NMR metabolomics was employed to analyse samples of exhaled breath condensate and blood plasma of control subjects and workers before and after the shift where various tasks related to the processing of nanocomposite materials were performed. The main aim of this work is to evaluate the molecular changes induced by NPs inhalation. Changes in the metabolic profiles of both biofluids were observed and correlated to NPs exposure. Furthermore, the affected metabolic pathways were determined and thus, differences in the acute and chronic effects of NPs inhalation were described. The achieved results confirm the applicability of NMR metabolomics in toxicological

studies since it is possible to evaluate the extent of toxic insult and to understand the molecular mechanism of nanoparticle-organism interaction.

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