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Dermální expozice polycyklickým aromatickým uhlovodíkům (Vybraná rizika Goeckermanovy terapie psoriázy)

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1 Summary

Dermal exposure of polycyclic aromatic hydrocarbons (Selected risks of Goeckerman therapy of psoriasis)

Polycyclic aromatic hydrocarbons represent a health-related group of substances commonly found in the living and working environment. Dermal form of exposure can make a very significant contribution to the overall burden on the body, and some authors estimate its proportion in severe exposures to almost half of the total absorbed dose of PAH. Contrary to this, dermal PAH exposure has so far received relatively little attention.

For testing in vitro dermal penetration, the OECD recommends two models, full skin and epidermal membrane. In the presented text I present the results of an in vitro trans-epidermal penetration experiment. When penetrating selected PAHs through the epidermal membrane, we found higher Flux values and lower Lag time values compared to PAH penetration through the full skin described in the previous work. Penetration of PAHs through the epidermal membrane also showed a lower degree of data variability, which reduced inter-individual variability of results. These findings suggest that the use of the epidermal membrane could refine both the estimate of the internal dose of PAH after dermal exposure and the estimate of the related health risk within a conservative exposure scenario. However, experiments with the epidermal membrane are time-consuming and especially experimentally demanding. So far, the objective integrity parameters of the epidermal membrane, analogous to the integrity parameters of full or dermatomic skin (TEWL and TER), have not been determined and the integrity of the epidermal membrane is only assessed visually. This assessment is not entirely reliable and membrane damage is only detected during the course of the experiment or in the analysis of the receptor fluid.

The CBMN results were compared with the results of the chromosomal aberration test (CAT), which is used at the Institute for a long time. Both tests showed comparable results and sensitivity in DNA damage detection. We consider the combination of these two DNA damage detection tests to be very suitable for testing mixed groups with different smoking habits after environmental and occupational exposure to PAHs. We consider it appropriate to express the results of both tests in the form of cell counts with a change in the total number of scored cells (number of binucleated cells with micronucleus per 1,000 binuclear cells, number of aberrant cells per 100 metaphase cells).

Using both tests (CBMN and CAT) performed in the blood of patients with psoriasis treated with GT (clinical dermal application of pharmaceutical tar/PAH and UV light), we found a significant level of genotoxic hazard/risk combination of 4% pharmaceutical tar and narrowband UVB 311 nm radiation.

Using the CAT test, we monitored the genotoxic hazard/risk levels of several GT variants (3%, 4% and 5% pharmaceutical tar in combination with two whole body emitters). The genotoxic hazard rate increased with increasing concentrations of pharmaceutical tar in ointment and probably reached its peak at 4% concentration. The degree of genotoxic hazard/therapy risk was also affected by UV radiation, where we demonstrated a higher genotoxic hazard/risk when using narrowband UVB 311 nm emitters. Based on our results, we believe that PAHs have not only clastogenic but also aneugenic potential for DNA damage. A synergistic effect of combined exposure of PAHs and UV radiation to DNA damage appears to be observed in the therapy under study. The use of 4% or 5% FD and broadband UV emitter seems best.