

# POSSIBLE GENOTOXIC RISK OF COMBINED EXPOSURE TO PHARMACEUTICAL COAL TAR AND UV-B RADIATION

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## SUMMARY

*Goeckerman's therapy of psoriasis combines exposure to pharmaceutical coal tar and UV-B radiation. In the pilot study (15 patients had been diagnosed with psoriasis, the average time period in hospital therapy was 24 days, the average age of the patients was 29 years, 47% of them were smokers) a level of genotoxic risk from therapy was evaluated by using chromosomal aberration of peripheral lymphocytes. The study suggested the presence of an increased genotoxic risk from the therapy. The PASI scores (Psoriasis Area and Severity Index) were monitored.*

**Key words:** coal tar, UV-B radiation, Goeckerman's method, genotoxicity

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## INTRODUCTION

Psoriasis belongs among frequent diseases in the Czech republic (CR) and in the world, its manifestation shifts constantly to younger age groups. Ambulatory care patients with psoriasis represent approximately 5% of all dermatosis cases. Hospitalized patients with psoriasis represent 7% of all dermatosis cases (11).

In CR and other countries Goeckerman's therapy of psoriasis is often used as the first option for a curative method. The therapy brings together the effects of pharmaceutical tar (coal tar with a high portion of polycyclic aromatic hydrocarbons - PAH), and the effects of UV-B radiation (3, 16). PAH represent very risky environmental agents (toxic, mutagenic, carcinogenic). It is necessary to count on the increased possibility of health risks in cases where combined exposure to PAH and UV-B radiation are used (2, 7). Goeckerman's therapy represents an efficient and economically advantageous method. From the point of view of dermatologists, the problem is the high uncertainty about the risk of side effects. The uncertain (the ignorance) level of possible genotoxic effects brings true doubts to both, patients (possibility of health damage due to non-occupational exposure to genotoxic agents) and physicians (high level of professional uncertainty). Information and statements presented above were obtained at dermatological departments.

The aim of presented pilot study is focused to genotoxic risk evaluation of patients exposed to the combination of pharmaceutical coal tar (PAH) and UV-B radiation (Goeckerman's therapy).

## RESEARCH DESIGN AND METHODS

Goeckerman's therapy of psoriasis combines exposure to pharmaceutical coal tar and UV-B radiation. For our pilot study a group of 15 patients with diagnosis of psoriasis was exposed to the combination of pharmaceutical coal tar. The coal tar in a form of unguent (3-5%) was applied daily to skin of patients (10-60%). The UV-B radiation was applied daily to whole body surface (1-15 minutes). The average time period of Goeckerman's therapy in hospital was 24 days, the average age of the patients was 29 years, 47% of them were smokers. In the pilot study the level of genotoxic risk from therapy was evaluated by using chromosomal aberration of peripheral lymphocytes (before and after therapy). The chromosomal aberrations were analyzed by the standard method for cytogenetic analysis of peripheral lymphocytes (1). The cytogenetical analysis results of chromosomal aberrations of peripheral lymphocytes were statistically processed. The objective therapy effect was evaluated by the PASI scores (Psoriasis Area and Severity Index) (6).

## RESULTS

The statistical analysis revealed significant differences between the chromosomal aberration levels before and after the therapy (Table 1).

A Psoriasis Area and Severity Index scores decrease as much as 89% within the study group.

**Table 1.** Chromosomal aberration of peripheral lymphocytes

Type of aberration (%)		Before treatment (n = 15)	After treatment (n = 15)	p - value	Statistic significance
ABB	Mean	1.26	2.93	0.00128	**
	SD	0.961	0.961		
SAB	Mean	0.73	1.40	0.08586	NS
	SD	0.961	1.183		
NAB	Mean	0.53	1.46	0.00110	**
	SD	0.639	0.833		
JAB	Mean	0.53	1.00	0.21994	NS
	SD	0.990	1.000		

Mean – arithmetic mean, SD – standard deviation, n – number of analyzed subjects, ABB – aberrated cells, SAB – structurally aberrated cells, NAB – numerically aberrated cells, JAB – aberration of another type, \*\* –  $p < 0.01$ , NS – non significant

## DISCUSSION

During his life every man is exposed to the harmful influences of many chemical and physical agents that are derived from occupational and non-occupational exposures (14). Besides “traditional” exposures from air, water, soil and food, it is also necessary to account for non occupational exposures from some long-term therapeutic outputs (8). The exposure to harmful agents during therapies can achieve quite high levels exceeding levels found in occupational setting (10).

The doubts about adverse health effects of pharmaceutical coal tar preparations are still being discussed (3, 4, 5, 9, 11, 12, 15, 16). However, only a limited number of experimental and clinical studies, focused mainly on the genotoxic effects of therapeutic coal and its hazard evaluation, do not allow consistent conclusions about the problem to an acceptable extent (5, 11, 13, 16). Nevertheless, even these inconsistent conclusions lead, in some countries, to the restriction of pharmaceutical use of coal tar preparations. It is necessary to stress that until now no study has been conducted on the base of methodic evaluation and quantification of combined risk of Goeckerman’s therapy (11).

In the pilot study 15 patients diagnosed with psoriasis and undergoing the Goeckerman’s therapy were examined for chromosomal aberrations (before and after therapy) (Table 1). In each sample 100 mitotic sets were analyzed. Before therapy they were analyzed in a total of 1,500 cells. From this set, 19 cells (1.2%) were aberrated. In 8 cases numeral aberrations, in 9 cases structural aberrations (breaks and exchanges), and in 2 cases the so called “other type of aberrations” were found. After therapy 1,500 cells were analyzed. From this set 41 cells (2.8%) were

aberrated. In 22 cases numeral aberrations, in 17 cases structural aberrations (breaks and exchanges), and in 2 cases the so called “other type of aberrations” were found. The statistic analysis revealed a significantly higher level of aberrated chromosomes after therapy.

In agreement with literature (11) and medical experiences observed Goeckerman’s therapy of psoriasis was successful.

## CONCLUSION

The results of treatment monitoring in our pilot study, presented by chromosomal aberrations of peripheral lymphocytes, suggested a higher level of health risk of genotoxicity in patients exposed to combination of pharmaceutical coal tar and UV-B radiation (Goeckerman’s therapy).

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