Influence of the PAH on the DNA Damage Detected in Unexposed and Occupationally Exposed Donors from Košice

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AIRNET A Thematic Network on Air Pollution and Health

NERAM Network for Environmental Risk Assessment and Management

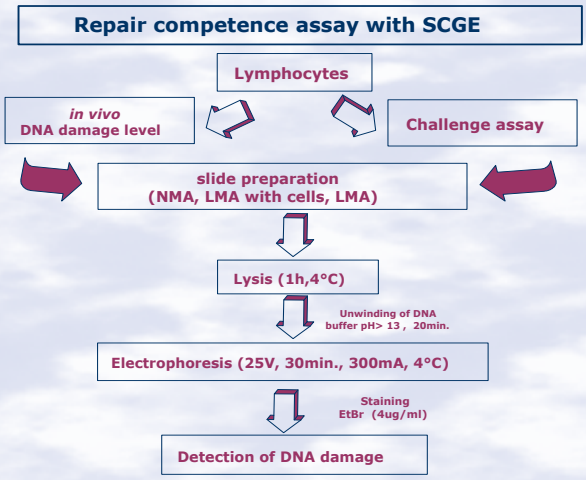
Introduction

The aim of our study was to investigate a cellular response to complex environmental genotoxic mixture and the possible influence of the occupational exposure to PAH on susceptibility to the induction of the oxidative types of the DNA damage. Lymphocytes isolated after samplings in Košice were transported frozen (in dry ice) to the laboratory of the DREB in the INP in Kraków, Poland, where they were stored in -70^{0}C for further treatments. A repair competence assay after a challenging dose of X-rays (oxygen radicals, oxidative and DNA damage inducing agent) was proposed for the study and the alkaline version of single cell gel electrophoresis (SCGE) assay was applied for the analysis of the DNA damage induced by various *in vitro* treatments [1,2]. The DNA damage was estimated by the automatic evaluation of the comet size that was performed with Komet 3.0 software from Kinetic Imaging, Liverpool, UK. For each treatment, 100 cells were analyzed (2 times 50 cells for each of two replicate electrophoresis). From various measures the tDNA - fraction of the DNA in the comet tail and TM- a comet tail moment, which is the fraction of the DNA in the comet tail multiplied by the tail length were used for the evaluation of the efficiency of treatments. Studies were performed in the presence of the standardizing samples of lymphocytes from the same referent pool of lymphocytes of healthy male donor (MS).

Materials and Methods

Donors: 55 unexposed (av. age 33.4y)

50 exposed (av. age 32y)



Evaluated parameters;

SVI_T, SVI_{TM} - standardized *in vivo* DNA damage level estimated for TDNA and TM parameters in comet assay

$SUSC_T$, $SUSC_{TM}$ – standardized cells susceptibility to X-rays estimated for TDNA and TM parameters

SRD_T, SRD_{TM} - standardized the percent of no repaired (residual) damage detected in cells after challenging doses assay estimated for TDNA and TM parameters

Results and Conclusions

Table. 1 PAH occupational exposure influence on cellular capacities in the results obtained with SCGE assay.

EXP	SVI_T ±SD	SVI_{TM} ±SD	$SUCS_T$ ±SD	$SUCS_{TM}$ ±SD	SRD_T[%] ±SD	SRD_{TM}[%] ±SD
0	6.56	1.84	11.91	5.82	60.73	41.75
	1.76	0.65	2.89	2.02	21.96	26.32
1	6.91	1.90	12.00	5.34	69.82	49.07
	1.94	0.70	2.85	1.60	25.60	26.10
Sig.	ns	ns	ns	ns	0.001	ns

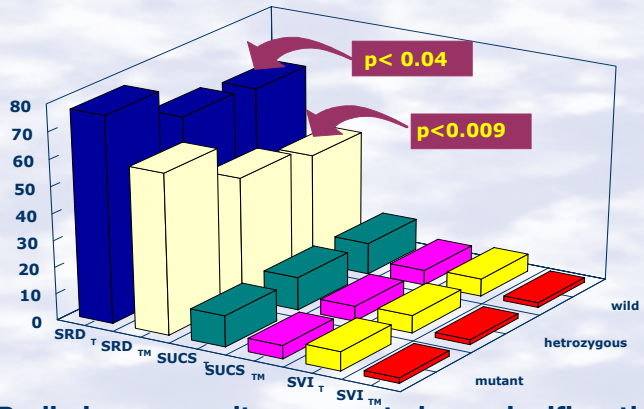
Significantly lower efficiency of the repair process of induced by the challenging dose damage in cells of occupationally exposed to PAH donors was observed.

Table. 2 Influence of smoking history(SH=0 nonsmokers, SH=1 smokers) on cellular capacities in lymphocytes.

SH	SVI_T ±SD	SVI_{TM} ±SD	$SUCS_T$ ±SD	$SUCS_{TM}$ ±SD	SRD_T[%] ±SD	SRD_{TM}[%] ±SD
0	6.73	1.88	12.17	5.78	62.56	41.32
	1.78	.68	2.87	1.94	23.55	24.29
1	6.68	1.86	11.70	5.40	67.53	49.40
	1.94	.66	2.85	1.74	24.49	28.15
Sig.	ns	ns	ns	ns	ns	0.04

Significantly negative influence of the smoking on the efficacy of the repair process was observed.

Figure. 1 Influence of GSTP I/V polymorphism on cellular capacities the results with SCGE assay.



Preliminary results suggested a significantly lower efficiency of repair process of the damage induced in lymphocytes of genetically polymorphic donors with mutation in exon 5 GSTP1 (GSTP1 Ile/Val).

Reference:

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2. D.W. Fairbairn, P.L.Olive, K.L. O'Neill. Mut. Res. 339 (1995) 37-59.

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