INFLUENCE OF OCCUPATIONAL EXPOSURE TO PAHs ON LYMPHOCYTES SUSCEPTIBILITY TO THE INDUCTION OF DNA DAMAGE (sampling in Sofia)

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Abstract

The aim of the study was to investigate a possible influence of the occupational exposure to PAHs on cellular susceptibility to the induction of the oxidative type of damage in lymphocytes collected from donors in Sofia. Similarly to the studies performed in the previous groups of donors the alkaline version of the SCGE assay was applied to evaluate the DNA damage present in lymphocytes after various treatments: in defrosted lymphocytes, in lymphocytes right after exposure to the challenging dose 4Gy of X-rays (as an oxygen radicals and oxidative damage inducing agent) and in lymphocytes after various periods of incubation following the X-rays exposure, to investigate kinetics and efficiency of the repair process. Lymphocytes were isolated from the whole blood samples of 78 healthy males: 25 donors unexposed (average age 39 years), 53 donors occupationally exposed to PAH (27 drivers of average age 43.3 and 26 policemen of average age 32.5 years). Among donors: 26.9% have never smoked, 20% gave up smoking and 52.6% were recent smokers. Evaluation of the DNA damage (tDNA, TM, TL) as a function of repair (post-irradiation incubation time) was done on the basis of two independent repetitions of the SCGE assay applied to each donor for the studies of kinetics. From the results obtained, susceptibility to the induction of the DNA damage, repair competence from the residual (unrepaired) damage and repair rate from the half life of the DNA damage repair process kinetics were evaluated. No difference between referent and exposed groups was observed in the damage induced either *in vivo* or by the challenging dose. Although, the residual damage on average is higher in exposed donors, and half the time of the repair kinetics longer, suggesting lower repair competence in lymphocytes from exposed donors, though observed difference is statistically insignificant. However, when evaluated repair competence was stratified to three subgroups; referent, policemen and drivers repair efficacy decreased statistically significantly (81% then 89% and 67% respectively $p < .004$). Surprisingly, no significant difference was observed between groups analysed according to the category of smoking habits, however, neither PAH nor B(α)P average concentrations were significantly differentiated between investigated sub groups. Our preliminary results also suggest, possibly due to different lifestyles, lowering of the repair rate with decreasing education level ($r^2 = -0.32$, $p < 0.02$), however, final conclusion should be drawn up when all kinetics data will be available.

Materials and methods

Lymphocytes isolated from the whole blood samples collected from 78 healthy males (26.9% never smoke, 20% were former and 52.6% recent smokers). Among donors:

- ❑ donors unexposed (n=25, average age 39 years)
- ❑ donors occupationally exposed to PAH (drivers;n=26, average age 43.3 years & policemen;n=27, average age 32.5 years)

Challenging dose of 4Gy of X-rays (as an oxygen radicals and oxidative damage inducing agent) and alkaline version of the SCGE assay was applied to evaluate the DNA damage present in:

- ❑ defrosted lymphocytes
- ❑ in lymphocytes right after exposure to the challenging dose
- ❑ in lymphocytes after various periods of incubation following the X-rays exposure (to study kinetics and efficiency of repair process Fig.1).

Results

- ❑ No significant difference between referent and exposed groups was observed in the damage induced either *in vivo* or by the challenging dose. (Table 1.)
- ❑ Residual damage on average is higher in exposed donors, and half time of the repair kinetics longer (Table 1.) though observed difference are statistically insignificant.

Table 1. Influence of occupational exposure

EXPOSURE		$SVIV_{TM}$	$SUCS_{TM}$	SRD_{TM} [%]	$t(1/2)_{TM}$
unexposed	MEAN	1.61	9.10	41.60	3.75
	±SD	0.91	1.62	17.74	2.00
exposed	MEAN	1.51	8.50	44.51	4.35
	±SD	1.00	3.03	19.35	3.57

Abbreviations:

$SVIV_{TM}$ - standaryzed *in vivo* DNA damage level in the defrosted cells estimated for TM parameters,
$SUSC_{TM}$ – standardized sucsceptibility to X-rays estimated for TM parameters,
SRD_{TM} - standardized sucsceptibility to X-rays estimated for TM parameters,
$t(1/2)_{TM}$ – mean half lives time of repair estimated for TM parameters.

Table 2. Comparison of results obtained for three supgroups donors stratified according job.

JOB		$SVIV_{TM}$	$SUCS_{TM}$	SRD_{TM} [%]	$t(1/2)_{TM}$
referent	MEAN	1.61	9.10	41.60	**3.75**
	±SD	0.91	1.62	17.74	**2.00**
drivers	MEAN	1.44	8.36	45.76	**5.46**
	±SD	0.94	3.76	23.27	**4.27**
policemen	MEAN	1.58	8.65	42.98	**3.10**
	±SD	1.07	2.07	13.85	**2.01**
p<		0.79	0.61	0.79	**0.019**

Repair rate statistically significant deffered for various jobs categories (Table 2).

No significant difference was observed between groups analysed according to the category of smoking habits (SUCS – 8.25-9.60-8.57, SRD – 42.67-43.13-43.65 for nonsmokers, former and recent smokers respectively) however, neither PAH nor B(α)P average concentrations were significantly differentiated between investigated subgroups

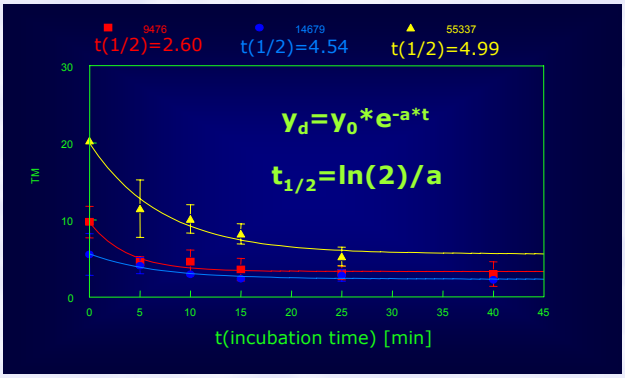

Fig. 1. Kinetics of repair of the DNA damage induced by the challenging dose of X-rays in lymphocytes of various donors

Conclusion

Our preliminary results suggest:

- **lower although insignificantly repair competence in lymphocytes from exposed donors,**
- **lowering of the repair rate with decreasing education level ($r^2 = -0.32$, $p<0.02$), possibly due to different life style,**
- **final conclusion should be drawn up when all kinetics data will be available.**

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