

CYTOCHEMICAL INVESTIGATION METHODS AS A CONTRIBUTION TO DIAGNOSTIC LEUKOCYTE TRITIUM DAMAGE

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ABSTRACT

The study analyses cytochemical characteristics of neutrophilic granulocytes. Alkaline phosphatase and myeloperoxidase activity was semiquantitatively determined from capillary blood smears stained acc. to Kaplow. Lipids content was examined with Sudan black B staining. The results of those cytochemical reactions are significantly different ($p < 0.05$; Mann-Whitni U-Test). Score values negatively correlate with absorbed doses but not linearly so that those methods contribute to diagnosing irradiation damage of granulocytes; but they do not have biological-dosimetric importance.

INTRODUCTION

Tritium, a radioactive isotope of hydrogen is widely used in numerous different scientific and economic fields. The specific role of tritium application is seen in so called "scintillating colours" which are mixtures of different, especially prepared, tritium compounds, so that they have a property of producing greenish scintillations. Having in mind the energy of tritium beta particles, the high activities are needed to accomplish this effect. Tritium is easily evaporable and contaminates the working environment. After the exposure, regardless to the way of penetration (respiratory or digestive tract, skin), it is easily found in blood circulation and is evenly distributed in all tissues and organs, as a component included in water metabolism. Biological half-life of elimination is 4-18 days. Leukocytes cytochemical properties were studied in workers exposed to scintillating colours, contributing in diagnostics of tritium induced damages.

MATERIALS AND METHODS

We analysed the number of neutrophilic granulocytes and values of cytochemical parameters in 21 tritium exposed workers and 11 controls. Capillary smears were stained for alkaline phosphatase activity by Kaplow's method, for peroxidase activity by benzidine reaction and for lipides by Sudan black. The intensity of staining is directly proportional to the extent of chemical reaction which is determined by microscopy on 100 cells and expressed as a score. On the basis of chromosome aberration the assessed absorbed irradiation dose is 0.12-0.59 Gy.

RESULTS AND DISCUSSION

The number of neutrophilic granulocytes is not significantly changed in tritium exposed workers (T-test for the small statistical group, $p > 0.05$) while the alkaline phosphatase (APL) and peroxidase (MPO) scores are significantly lower ($p < 0.05$, Mann Whitney's U-test). There is no significant changes in Sudan reaction (Table 1).

Table 1.

The number of neutrophils, APL, MPO and SUD scores in tritium exposed workers and controls

Examined group	n	N	NPL	MPO	SUD
E	21	3,2	36	148	214
K	11	3,8	58	196	224
p		0,7NS	0,05S	0,05S	0,3NS

APL score correlation with the absorbed dose is significant and correlation coefficient is 0.46. (Short 1). MPO score correlation with absorbed dose is negative, but statistically insignificant while Sudan reaction was not in correlation with the dose.

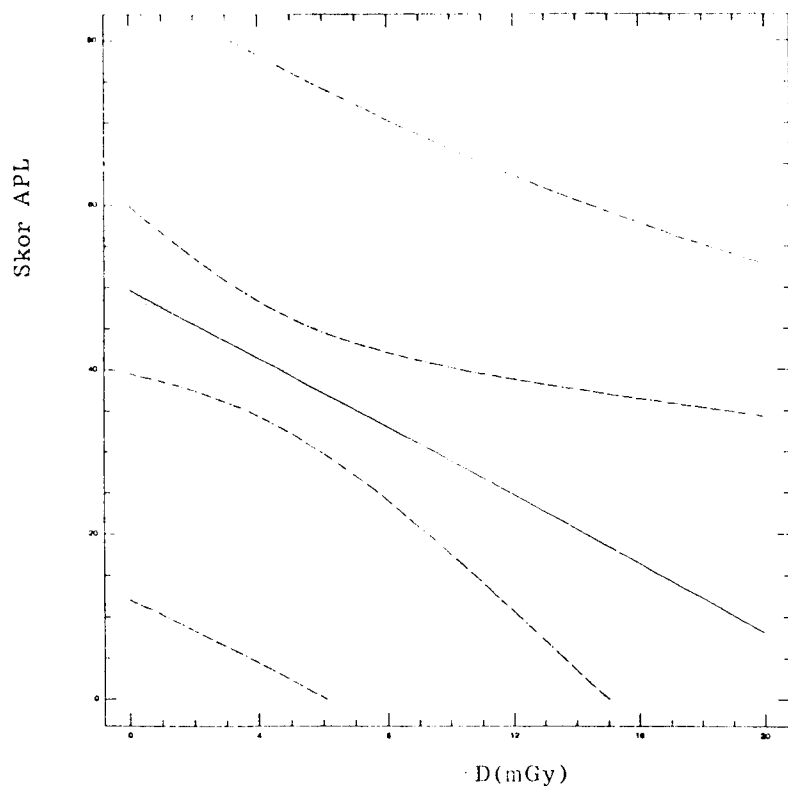


Figure 1.

The correlation of APL scor
with the absorbed dose
($r = - 0.46$)

Cytochemical reaction to alkaline phosphatase and peroxidase suggested significant tritium-influences changes in leukocytes when their number was unchanged. Both scor-values correlation with the dosis showed that the reaction intensity is decreased together with the dosis, although not linearly, therefore, they can't be used for biodosimetry. No changes were shown in Sudan reaction, thus it was insignificant in diagnostics of leukocytes damages induced by tritium, i.e. beta irradiation.

CONCLUSIONS

Applied cytochemical reactions to APL and MPO are semiquantitative and easily followed tritium effects on exposed workers leukocytes which could help in early diagnosing of its function impairment related to body defence reactions.

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