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PROFESINĖ APŠVITA IR JOS CITOGENETINIO POVEIKIO TYRIMAI IGNALINOS AE DARBUOTOJŲ LIMFOCITUOSE

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SANTRAUKA

Lietuvoje Ignalinos AE darbuotojai sudaro didžiausią grupę asmenų, dirbančių tiesiogiai su jonizuojančiosios spinduliuotės (JS) šaltiniais ar su jų sąlygojama apšvita susijusį darbą. Profesinės apšvitos dozės paprastai neviršija leistinos 20 mSv metinės dozių ribos, tačiau daugelis tyrimų patvirtino, kad net mažos JS dozės gali reikšmingai padidinti chromosomų aberacijų (CA) dažnį periferinio kraujo limfocituose.

Šio darbo tikslas buvo ištirti CA dažnius didžiausias apšvitos dozes gaunančių Ignalinos AE darbuotojų kraujo limfocituose ir įvertinti skirtingos profesinės apšvitos tipų bei atliekamų darbų lemiamą riziką. Visoje tirtų Ignalinos AE darbuotojų grupėje nustatytas patikimai didesnis palyginus su kontroline grupe bendras CA dažnis (3,26 *vs* 2,18 CA/100 ląst.), chromosominio tipo aberacijų (2,18 *vs* 0,82), acentrinių fragmentų (1,54 *vs* 0,65) ir dicentrinių chromosomų (0,51 *vs* 0,03) dažniai (p < 0,05). CA dažnis Ignalinos AE darbuotojų grupėje tik su išorine apšvita patikimai nesiskyrė nuo dažnio stebėto kontrolinių asmenų grupėje (2,56 *vs* 2,18 CA/100 ląst., p > 0,05). Ignalinos AE darbuotojų grupėje, kurioje be išorinės apšvitos buvo registruota papildoma vidinė apšvita, nustatyti patikimai didesni palyginus su kontrole bendras CA dažnis (3,61 *vs* 2,18), chromosominio tipo aberacijų (2,37 *vs* 0,82), acentrinių fragmentų (1,58 *vs* 0,65) ir dicentrinių chromosomų (0,65 *vs* 0,03) dažniai (p < 0,05). Todėl šių asmenų darbinė veikla galėtų būti vertinama kaip potencialiai didesnės apšvitos bei rizikos sveikatai šaltinis. Citogenetinių tyrimų rezultatų dispersinė analizė parodė, kad darbas su jonizuojančiosios spinduliuotės šaltiniais Ignalinos AE gali būti siejamas su chromosominio tipo aberacijų (F = 4,91; p = 0,034) ir acentrinių fragmentų (F = 5,90; p = 0,021) dažnio padidėjimu, o vidinė apšvita turi statistiškai patikimą įtaką dicentrinių + žiedinių chromosomų dažnio padidėjimui (F=5,37; p = 0,027). Kitų veiksnių (rūkymo, amžiaus ir darbo stažo) įtaka chromosomų aberacijų dažniams nėra patikima. Taip pat nenustatyta patikimos koreliacijos tarp chromosomų aberacijų dažnių ir sukauptų fizikinių bei koreguotųjų fizikinių dozių (p > 0,05).

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Occupational radiation exposure and cytogenetic monitoring of Ignalina Nuclear Power Plant workers

SUMMARY

The Ignalina Nuclear Power Plant workers (INPP) represent the largest group of workers occupationally exposed to low-level doses of ionizing radiation in Lithuania. Though individual doses of the INPP workers for many years have been declining and are retained within officially accepted limits, many reports demonstrate that low-level occupational exposure to ionizing radiation can significantly increase chromosome aberration levels in blood lymphocytes. Moreover, chromosome aberrations are believed to be a possible biomarker reflecting chromosome damage in target tissues which in turn is linked to cancer development. Therefore many studies have been dedicated to investigate the cytogenetic effects of low-level radiation in blood lymphocytes, especially trying to establish dose-effect relationship and predict possible cancer risks. The objective of the current study was to analyze chromosome aberration levels in lymphocytes of the INPP workers subjected to relatively high individual doses of occupational exposure (mean accumulated doses 280.2±44.9 mSv), taking into consideration different types of ionizing radiation. A total of 21 blood samples from INPP workers and 17 control samples were analyzed. Cytogenetic analysis revealed significantly increased CA levels in the whole group of INPP workers (3.26±0.34 CA/100 cells) and a subgroup of workers additionally exposed to internal radiation (3.61±0.45 CA/100 cells), when compared to controls (2.18±0.17, $p < 0.05$). No significant increase in CA frequency was observed for a subgroup exposed to external γ-rays only. When taking into account the yield of chromosome-type aberrations, acentric fragments and dicentrinc chromosomes all groups significantly differed from the control group ($p < 0.05$). Significant increase in dicentric + ring chromosomes (0.70±0.14/100 cells) was observed in a subgroup of workers additionally exposed to internal radiation as compared to workers with external irradiation. A comparison of two repeated samples (within period of 3 years) from 7 selected workers demonstrated a significant decrease in chromatid-type aberrations. The analysis of variance disclosed a significant input of occupational exposure to the yields of chromosome type aberrations and acentric fragments in the INPP workers. A significant influence of internal exposure was confirmed for dicentric + ring chromosome levels. No correlation between the accumulated doses and aberration yields was determined, neither was the influence of such factors as smoking, age and working time confirmed.

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