Contribution ID: **139** Type: **poster preferred**

Cytogenetic effects of chronic exposure of the Red Bone Marrow in humans

Tuesday, 16 October 2012 16:20 (1 minute)

Population exposure to ionizing radiation in the Urals region (Russia) occurred as a result of failures in the technological processes at the Mayak plutonium facility in early 1950s. A major source of environmental contamination was releases of liquid radioactive wastes into the Techa River in 1949–1956 with peak amounts from September 1950 until November 1951. Over 30,000 persons living in villages located along the river downstream from the site of releases were exposed to significant levels of external and internal (mainly from 89, 90Sr) irradiation. The main pathways of exposure for the Techa riverside population were from drinking water and consumption of contaminated local foodstuff (mainly cow's milk) and external gamma exposure due to proximity to bottom sediments and contaminated floodplain soils (Degteva et al. 2006).
This paper includes the results of cytogenetic study of individuals exposed at the Techa River followed-up for over 40-year period (Akleyev et al. 1995). The main outcomes of the study were the following:
• A significantly high level of unstable chromosomal aberrations (UCA) in T-cells of exposed individuals (RBM cumulative dose range from 0.1 Gy to 3.0 Gy) was observed during the whole period of observation.
• The frequency of UCA decreased by a factor 2-3 over the last 30 years.
• The level of spontaneous UCA in rural residents remained stable over the whole period and was 0.6-0.8 dicentrics and rings per 1000 cells.
• The frequency of translocations in exposed individuals differed significantly from non-exposed group of the same age (Bauchinger et al. 1998, Degteva et al. 2005).
• A significant linear dependence (dose range from 0.5 Gy to 3.6 Gy) between the radiation induced translocations and individual RBM dose from incorporated 89, 90Sr was found (Vozilova et al. 2012).

The research was partially funded from the European Community's Sixth Framework Programme under grant agreement № FP6-516478 ("Southern Urals Radiation Risk Research") (SOUL) and the European Community's Seventh Framework Programme under grant agreement № FP7-249675 ("Epidemiological Studies of Exposed Southern Urals Population") (SOLO).

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Session Classification: Poster Session 1

Track Classification: Biological and Physical Dosimetry