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Letter to Editor

Leukemia and cardiovascular diseases in the Techa river cohort: New interpretation required

GESDAV

Sir,

The relatively large discharges of radioactive materials into the Techa river in the Southern Urals occurred between the years 1949 and 1956 [1,2]. The most exposed individuals were residents of villages along the river. The Techa river cohort (TRC) consists of over 30,000 people who were born before the start of exposure in 1949 and lived along the Techa river [3]. In the author's opinion certain studies tended to exaggerate the relationship between the radiation exposure and enhanced risks, e.g. of cardiovascular diseases or leukemia. The study [4] on the cardiovascular diseases in the TRC was commented previously [5]. It was concluded that the results of [4] do not prove any causal relationship between the low-dose radiation exposure and cardiovascular diseases, but rather question the conclusions about an increase in the risk of solid cancer and leukemia reported by analogous studies of the TRC [6-10]. Note that the radiation doses in experimental and clinical studies, associated with effects relevant to the cardiovascular system [11], have been considerably higher than in the study [4], where over 90% of the cohort members received estimated doses <100 mGy. To the best of the author's knowledge, this radiation dose level has never been reliably demonstrated to enhance cancer or other health risks; a literature overview is in Ref [12].

The cohort members of the study [10] must have been generally aware of their dose estimates calculated on the basis of their age and residence history [3]. Although many factors were taken into account in the epidemiological research (age, gender, ethnicity, place of residence, etc.), it can be reasonably assumed that attention of the cohort members was predominantly concentrated on the radiation doses: Many of them were preoccupied with monetary compensations (Dr. Krestinina, personal communication, 2013), others probably with radiation-related health problems; while approximately known dose values could have influenced the subjects' behavior thus creating a bias. Individuals with higher dose estimates were probably on average more motivated, consciously or subconsciously, to undergo medical examinations, being at the same time given on average more attention. A similar phenomenon of the "dose-dependent participation of self-reported prescreening cases" was noticed among the residents of the contaminated territories after the chernobyl accident in regard to thyroid cancer [13]. Apparently, a detection probability of a disease without specific focal symptoms such as leukemia would be higher in people with higher dose estimates; more details are in Ref [14].

Furthermore, in the article [10], a comparison was made with the atomic bomb survivors (ABS): "Although it may appear that effect in the TRC is larger than that of the ABS, there are large uncertainties and the estimates are not statistically significantly different. As such, there is no indication that leukemia risks in this low-to-moderate dose, low-dose-rate population differ from those in the acutely exposed ABS population" [10]. This questionable statement should be verified by independent experiments. Note that carcinogenic potential of an acute exposure to low-linear energy transfer radiation has been considered to be higher than that of protracted or fractionated exposure: If a given dose is administered at a lower rate or is split into many fractions, a biological system would have more time for reparation, so that the total damage is expected to be lower [15,16].

Finally, the estimates of radiation risks after the low-dose low-rate radiation exposures may be subject to biases [17,18]. The above and the previously published [14,19] arguments suggest that some reported correlations between the low-dose radiation exposure and health risks can be explained by factors irrelevant to the biologic effects of ionizing radiation. One of the mechanisms explaining for such correlations is apparently a dose-dependent difference in the quality and frequency of medical examinations. The dose-effect relationships after low-dose exposures should be studied in animal experiments with exactly known doses and dose rates, possibly shielded from biases and confounding factors.

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