Malignant neoplasms in the offspring of female Mayak workers

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The first nuclear complex in Russia, operating since 1948.

Noted for substantial radiation exposures from external gamma-radiation and α-particles from incorporated $^{239}$Pu in 1948-58 (period of technology development).
Objective:

Preconceptional exposure to prolonged external γ-radiation of the Mayak PA female workers

Malignancies in their children

Sources of information for the study:

Mayak Workers Cohort:
25% of female workers

Cancer Registry since 1948

Children Registry more than 90000 persons

N.B. 70 years of follow-up period
Methods:

- Retrospective epidemiological analysis
- Cohort of offspring born in 1949-1990: **2061** children from 1404 female Mayak workers

**Study group**

Mothers of **1145** children had accumulated doses of preconception external gamma-exposure to the ovaries

**Control group**

**916** offspring of female Mayak workers that were not exposed to preconception irradiation of gonads

- The vital status and cancer incidence in the offspring were followed up to **31.12.2018**
- The number of person-years of follow up in the cohort made **67740** years

**AMFIT module of the EPICURE software**

**95% confidence interval**

Analysis of the structure and crude rates of cancer incidence

**Relative risk**

**Excess relative risk** to a dose unit of external γ-exposure
Results: Part I

The range of maternal doses of preconception external $\gamma$-exposure to the ovaries: maximum dose in male offspring reached 2955 mGy and 4076 mGy in female offspring.

A total of 92 cancer cases were registered in 1949-2018 among offspring of female Mayak workers.

Significant increase of cancers was indicated after the offspring had reached the age of 50 years.

Average age of the observed cohort is 32 years for men and 33 years for women.

The malignancies of digestive organs and breast were registered most often in the Study group.

Among offspring of Control group we had indicated a significant increase of brain tumors in male offspring and of the malignancies of corpus uteri among female offspring.
Results: Part II

Calculation of RR of cancers in the offspring showed no significant difference for all malignancies, for solid cancers separately, and for other most frequent cancers.

RR in dose categories below 25 mGy and 140-450 mGy was the highest but was not statistically significant.

Assessment of ERR coefficients in relation to maternal accumulated absorbed dose of preconception external gamma radiation to the ovaries had revealed no statistically significant increase of cancer incidence.
Conclusions:

I. We had obtained no reliable evidence in our investigation of the relation between cancer in the offspring of Mayak PA female workers and accumulated doses of preconception external gamma-exposure to the gonads.

II. Further research is needed taking into account relatively young average age of the observed cohort of the offspring...