Three major reasons why transgenerational effects of radiation are difficult to detect in humans

Ionizing radiation can induce mutations in the germ cells (sperm, egg) of a variety of organisms, including fruit flies and mice, which can lead to genetic effects in the offspring. At this point, no evidence of transgenerational effects (effects passed down to the next generation) has been found in humans. This paper looked to answer the question of why effects have not been observed in people.

Based on a review of the literature, several possible explanations were suggested by the authors. These included: the environment in the ovary with its oocytes (female germ cells; in other words, immature eggs) lacks oxygen, meaning the cells are more resistant to radiation's effects; transgenerational effects might be difficult to detect due to a lack of genes that can serve as markers for inherited chromosomal abnormalities caused by radiation; and pregnancy in a human fetus[1] with abnormalities often ends in miscarriage[2], a phenomenon that does not occur in mice.

It is proposed by the authors based on their review of the literature that the lack of clear evidence for transgenerational radiation effects in humans probably has more to do with biology than methodological issues in previous studies. For that reason, whole genome sequencing[3] studies of exposed parents and offspring are now being developed at RERF, but such studies must be performed with care to avoid societal discrimination of the kind that has burdened atomic bomb survivors in the past.

Notes

[1] Human fetus:
An unborn offspring that develops in the womb. The fetal period begins at nine weeks after fertilization of an egg by a sperm and ends at the time of birth.

[2] Miscarriage:
Miscarriage, also known as spontaneous abortion or pregnancy loss, is defined as the death of a fetus (or, earlier in the pregnancy, of an embryo) before birth.

[3] Whole genome analysis:
The technology is used to decode the sequences of genetic base information that makes up the DNA of living organisms. Such analysis makes possible the understanding of the entire genetic information of any given individual.

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RERF's objective with this brief outline is to succinctly explain our research for the lay public. Much of the technical content of the original paper has been omitted. For further details about the study, please refer to the full paper published by the journal.