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CENTER FOR HUMAN RADIOBIOLOGY

Fact Sheet on

A Study of Birth Characteristics of Offspring of Female Radium Dial Workers

The extensive studies of Japanese children exposed in utero to atomic bomb radiation have disclosed no apparent effects on birth weight or birth defects. An apparent effect on head size and intelligence, however, has been noted. Studies of all of these variables on persons exposed in utero to other types of radiation are needed. The Radium Project provides the potential for such studies. Measurements of the radium content of a fetal skeleton indicate that radium crosses the placental barrier.

Study Group: As a pilot project, offspring of dial painters who worked in Illinois will be the target population. A search of Argonne records disclosed 1366 offspring of Illinois dial workers with measured body burdens (Table 1). These records include date of birth for most offspring, and date of first exposure of mother. These data will be used to estimate fetal radiation dose. For example, if the mother's accumulated skeletal dose from ^{226}Ra was 100 rads at 40 years after a brief intake period, her body burden at conception 5 years after intake would be about 90 nCi. The alpha-particle dose (full-term) would be about 50 mrad to the fetal skeleton and 0.2 mrad to the fetal fluids. The gamma-ray dose to the fetus would be about 1 mrad from ^{226}Ra in the maternal skeleton. At natural levels, the alpha-particle dose from radium and radon is about 1 mrad to the fetal skeleton and 0.04 mrad to the fetal fluids, whereas the dose from external gamma-rays plus ^{40}K is about 70 mrad in 270 days.

Methods: Abstracts of birth certificates have been obtained on all but about 150 of the 1366 offspring. The data obtained include sex, plurality, place of birth, mother's age, father's age, parents' education, other children (born alive, born dead, now dead), complications of pregnancy and labor, length of gestation, birth weight, and birth defects. The availability of these data varies over time. For example, birth weight and birth defects have been reported only since 1950.

Variables of interest for investigation of possible radiation effects are sex (for sex ratio), birth weight, length of gestation, birth defects, plurality, and complications of pregnancy and labor. Other data are collected mainly as confounding variables in analyses.

Internal and external comparisons will be possible on some data. Comparisons should be feasible with data from Illinois and the entire U. S., by calendar time. Comparison of dose groups on possible confounding variables will be necessary, in analyzing birth weight distributions, birth defect frequencies, and other birth characteristics. Despite the limitations of birth certificates,

Prepared by A. P. Polednak

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their value as a resource of information on major (externally evident) anomalies is recognized (U. S. National Committee on Vital and Health Statistics, 1968).

Future Plans: An important possible second phase of the study of offspring would involve physical examination, with measurement of head size and intelligence, and medical examination for birth defects or other conditions related to prenatal factors. Studies of mortality in early life (e.g., from leukemia and childhood cancers) would be facilitated by the information gathered in the birth certificate study.

Table 1. Estimated Sample Size: Offspring of Female Radium Dial Workers (in Illinois companies)

Average skeletal dose to mother (rads)*	No. of offspring
<1	254
1—9	629
10—99	343
100+	140
Total	1366

* This dose parameter will not be used in analysis, but is given here as an indication of range of maternal exposure to radium. Dose to the fetus will be estimated by using maternal body burden at time of conception; methods of calculation have been developed.

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