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RAT MAMMARY CARCINOGENESIS FOLLOWING NEUTRON- OR X-RADIATION

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Female, 61 - 63 day-old Sprague-Dawley rats were exposed once to a single dose of either 0.43 MeV neutrons or 250 kV X-rays. For neutrons, 23 rats were exposed in plastic tubes rotated around and 31 cm from a water-cooled tritium impregnated target bombarded with 2.45 MeV protons from a Van de Graaff generator. The mean kerma was measured at the rat location by integrating the response of a rat-sized homogeneous tissue equivalent ionization chamber of minimal mass. The ratio between absorbed dose and kerma is under investigation and is anticipated to be approximately 0.7. A compensated Geiger-Muller gamma ray dosimeter indicated that the gamma ray doses were 3.5% of the total dose. All rats were examined weekly for the presence of breast tumors and these were removed, fixed, stained and verified histologically as mammary neoplasms. At 10 months after exposure 98% of the rats were alive. The neutron kerma, the percent of rats with mammary neoplasia, and the number of rats were, respectively: 0.125 rads, 8.2%, 182; 0.5 rads, 9.0%, 89; 2 rads, 20.6, 68; and 8 rads, 31.1%, 45. The X-ray results were: 30 R, 7.4%, 95; 60 R, 27.1%, 48; and 90 R, 35.4%, 48. A 3.0% incidence was found in 167 control rats. At 10 months after exposure the mammary neoplastic response after 8 rads of neutrons correspond approximately to that after 60 - 90 R of X-rays. Similarly, the response after 2 rads of neutrons was intermediate between 30 and 60 R of X-rays and the response after 0.125 and 0.5 rads of neutrons was similar to that after 30 R of X-rays. This demonstrates that the RBE for 0.43 MeV neutrons is much lower at high doses than at low doses. Determination of the confidence limits for the dose-RBE dependence and dose-incidence relationship will be determined as additional data are collected.

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