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Physics in Radiation

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PHYSICS IN RADIATION

LUCILLE DUSAULT

In addition to experience as a physicist in the problems of radiology involving the patient, (problems of health physics, treatment planning, dosage calibration and mapping, and the like), the writer brought to Henry Ford Hospital a deep interest in research on the subject of time-dose relationships, i.e. the adjustments, which must be made in a dose of radiation to compensate for a change in the time during which the radiation is administered in order that the effect of the treatment will be the same. As a co-author, two papers had been published previously, one giving the time-dose curve for cancerocidal effect upon squamous cell carcinoma of the cervix uteri* and the other for adenocarcinoma of the corpus uteri**. After coming to Henry Ford Hospital the general subject of time-dose relationships was studied further and was discussed by the author in a paper before the American Radium Society in 1954***.

The possibility of improving the results of radiation therapy by a change in the fractionation of the total dose was suggested at that time. In order to explore this, a project was begun in the Fall of 1955 with Dr. Iler. This is partly supported by a grant from the American Cancer Society. Successive groups of C3H mice with spontaneous mammary adenocarcinomas were given increasingly larger doses in the same overall time, but with different spacings of the individual treatments within that time, in order to find a combination of dose and interval between treatments which would show better results than other combinations. A statistically significant difference in results between two of the combinations has been noted and will be reported shortly.

Another subject under investigation is the problem of bolus for telecobalt therapy. Ordinary bolus, as used in conventional x-ray therapy, cannot be used because of the production of electron equilibrium at the surface of the skin with consequent loss of the skin-sparing aspect of cobalt therapy — one of its chief advantages. Consequently, a tin-lined bolus was tried, the optimum thickness of tin determined, and resultant build-up under the skin demonstrated. The same idea can be applied to treatment cones.

*Optimum Dosage Studies for Radiation Therapy of Carcinoma of the Uterine Cervix. *Radiology*, 62, 862 (1954) (with James F. Nolan, M.D.).

**Radiation Treatment of Carcinoma of the Corpus Uteri. *American Journal of Roentgenology, Radium Therapy, and Nuclear Medicine*, 71, 669 (1954) (with W. E. Costolow, M.D., James F. Nolan, M.D., and G. C. Budenz, M.D.).

***Time-Dose Relationships. *American Journal of Roentgenology, Radium Therapy, and Nuclear Medicine*, 75, 597 (1956).