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STUDIES ON MOUSE LUNG TUMORS INDUCED BY X-IRRADIATION

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The effect of localized thoracic doses of 10 Gy X-rays, delivered either as single doses or as two equal doses separated by a 12-hour interval, on lung tumor formation in C3H/He male mice was examined. Both single and split irradiations gave an equal incidence of lung tumor, approximately 30%. This value was significantly higher than that of non-irradiated mice. The present data suggest that injury related to tumorigenesis is not repaired within 12 hours.

Both the incorporation of ^3H -thymidine into alveolar cells and the percentage incidence of lung tumors were measured to investigate the relationship between the kinetics of the cell proliferation in the lung after irradiation and tumor formation. As a result, the number of tumors formed was reduced in the experimental group in which cell proliferation was induced 10 days after irradiation. On the other hand, tumor formation was more frequently observed in the groups which showed no proliferative response. The incidence in the group exposed to a single dose at 14:00 was significantly higher than that of non-irradiated mice, but the incidence in the group exposed at 02:00 was approximately the same as that of non-irradiated mice. These data suggest that the mice may possess a diurnal variation in tumorigenic radiosensitivity, which is high at 14:00 and low at 02:00.

Furthermore, information concerning the turnover time of alveolar cells was derived from continuous ^3H -labeling. The labeling curve showed that the percentage of labeled cells increased linearly with the increase in the period of exposure to ^3H -thymidine. The slope of the line indicated a turnover time of 289 days.

Type II alveolar cells have been considered as a likely candidate for the target cells for radiation. These cells were identified with histological techniques, and their proportion to whole lung cells was 4.3%. Since the number of whole lung cells was measured as 5.8×10^7 /lung by a biochemical method, the number of type II cells was calculated as 2.5×10^6 /lung.