EFFECTS OF X-RAYS ON LUNG TUMOR FORMATION IN C3H MICE

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The effects of localized thoracic doses of X-rays delivered either as single doses (5–15 Gy) or split doses (5 Gy × 2) on lung tumor induction in C3H/He male mice were examined. Proliferative response of lung cells in the acute phase after a single irradiation was also examined by an autoradiography technique. In this study, the phenomenon of recovery related to the dose-rate effect on tumor induction, and the relationship between tumor induction and acute-phase lung cell proliferation were discussed.

The lung tumor incidence in C3H/He mice after a single 5–10 Gy irradiation was higher than the spontaneous incidence, and the incidence after 12.5–15 Gy irradiation was lower than that after 10 Gy irradiation. This result showed that the dose-response curves for radiation induction of lung tumors were 'bell-shaped'. It is thought that the dose-response curves are determined in terms of the competition between induction and cell killing.

For the dose-rate effect, two equal doses (5 Gy × 2) separated by various intervals (6 hours–7 days) were given, and this total dose (10 Gy) was the highest dose that induced lung tumors after a single dose. The lung tumor incidence after split doses was higher than that after a single dose. This result suggested that suppressive action had occurred in this total dose. However, the incidence was decreased with extending the intervals between fractions. This suggested that some damage related to tumor induction recovered. The half-time of this recovery was about half a day. however, it could not be determined in detail because there were few changes in the tumor incidence and few experimental points.

For the proliferative response of lung cells, the responses were observed for 40 days from the 10th day after 1.25–15 Gy irradiation. The peaks of these responses were delayed with increasing doses, and these patterns of delay may be related to the lung damage presumed from the dose-response curve in lung tumor induction. This relation suggested a correlation between lung tumor induction and lung cell proliferation after irradiation. The change of the number of type II pneumocytes after a 2.5- or 5-Gy single dose was not observed with immunostaining methods.