

Effect of X-ray and ^{131}I Irradiation on Human Thyroid Cells

T. SAKURAMI and M. FUKASE

Second Division of Internal Medicine

K. TORIZUKA

Department of Central Radiology

M. HORIKAWA and T. SUGAHARA

Department of Experimental Radiology, Kyoto University School of Medicine, Kyoto

The treatment of hyperthyroidism with ^{131}I is now in common use as the thyroid tissue has a specific activity to concentrate iodide intracellularly. However, a gradual increase of the delayed onset of hypothyroidism after ^{131}I treatment is now a noteworthy problem. It seemed to be the difference was the sensitivity of the thyroid cells for ^{131}I .

An attempt to obtain a fundamental idea has been made by use of human thyroid cells *in vitro*.

Thyroid gland specimens were obtained immediately after dissection in the operating room. Under these aseptic conditions thyroid gland specimens were quickly placed in phosphate balanced salt solution (PBS(-)) freed from attached connective tissue, minced with scissors, and washed with PBS(-). Tissue and 10–20 ml of 0.25% trypsin solution per g of tissue were incubated on a shaker. After incubation with enzyme for 1½ hr the tissue was mixed vigorously with a pipette, allowed to settle briefly, and the supernate containing the thyroid cells was removed. Supernates were then centrifuged at 1000 rpm for 5–10 min, the supernates were discarded, the cells were washed with PBS(-) recentrifuged, then suspended in 199 medium with 20% bovine serum. Cell concentrations were thus diluted to 30–50 clumps of thyroid cells per low microscope field. These cell suspensions were placed in tissue culture bottles and incubated at 37°C for 24–48 hr without disturbance. Evidence that the sheet of cells is composed of true thyroidal epithelial cells has

been presented previously by Kerkof, Long and Chaikoff. Such a techniques were available to obtain a comparative effect of intra and extra cellular irradiation by X-ray and ^{131}I utilization *in vitro*. The group of X-ray irradiation was consisted of the cultures in control and 200R, 400R, 800R, and 1000R irradiation. The group of ^{131}I -irradiation was consisted of the cultures in control and medium containing 25 μCi , 50 μCi , 100 μCi , 200 μCi , and 400 μCi of ^{131}I per milliliter. After incubation for 1 to 10 days at 37°C, medium was discarded and the cells still attached to the glass were stained with 1/1000 crystal violet solution for nuclei and then counted by means of hemocytometer. In the 10-day-old cultures, the survival ratio was expressed as a percentage of the corresponding value in control. In the group of X-ray irradiation, the mean survival ratios in 200R, 400R, 600R, 800R and 1,000R irradiation were 77.0%, 71.7%, 68.5%, 62.4% and 53.6%, respectively. In the group of ^{131}I irradiation, the mean survival ratios in medium containing 25 μCi , 50 μCi , 100 μCi , 200 μCi and 400 μCi of ^{131}I were 96.1%, 82.1%, 78.9%, 91.3% and 78.9%, respectively. The cell growth curves in the thyroid gland specimens obtained from the patients with hyperthyroidism and non-toxic nodular goiter showed almost the same tendencies.

Further experiment will be tried by using thyroid gland specimen obtained by needle biopsy.