enase gave very faint reaction in the normal mucosa.

In adenomatous polyps typical glands showed almost same activity of SDH, DPNHD and LDH as in normal mucosa or slightly higher activity than in the latter.

Glucose-6-phosphate dehydrogenase gave slightly increased activity in these glands. On the other hand, it was noteworthy that the atypical glands of polyps showed high activity of succinate dehydrogenase. LDH, DPNHD and G6PDH showed moderate elevation of activity in these glands.

In the cases of carcinoma, characteristic pattern of succinate dehydrogenase activity is divided into two groups. One group discloses very low activity and another one maintains almost same activity as that of the normal mucosa.

However, it was characteristic that quite irregularity and variation of SDH activity was observed in both groups.

DPNHD, LDH, TPNHD and G6PDH showed remarkable elevation of activity compared with that of normal mucosa and benign proliferative lesions.

At the invading margin of carcinoma and in sprouting cancer cells, marked elevation of DPNHD activity and moderate elevation of activity of LDH, TPNHD and G6PDH were noted.

It is supposed that these enzymes have close relationship to cancer cell proliferation. Especially the finding of DPNHD is supported by the report by Miyaji and Abe who found marked elevation of its activity during prophase of mitosis of Ehrlich's ascites tumor cells and clarified a close relationship of this enzyme activity to cancer cell mitosis.

From the attitude of these key dehydrogenases in pathways of sugar metabolism, it is emphasized that inactivation or irregular operation of TCA cycle and activation of hexose monophosphate shunt, glycolytic pathway and diaphorase system are shown as a characteristic pattern of sugar metabolism in carcinoma of the large intestine.

Histochemical Observation on Acid Hydrolase Activities in Irradiated Tumor Cells

Yukio Shimosato* and Keiichi Watanabe**

* National Cancer Center Research Institute, 3rd Histopathology Section, Tokyo
** Keio University, Department of Pathology, Tokyo

Since the morphological changes induced in human tumors by radiation consisted mainly of lysis of tumor cells, we assumed that the site of primary lesion might reside in the cytoplasm, producing disorganization of enzyme systems. Therefore, the changes in the cytoplasmic organelles following ir-
radiation were investigated. The following enzymes were selected as markers; acid phosphatase (ACP) and β-glucuronidase (β-G) for lysosomes and DPNH diaphorase (DPNHD) for mitochondria.

A 4-Nitroquinoline-N-oxide induced Donryu rat pulmonary carcinoma was transplanted into the right hind leg of rats weighing 100 to 150gm. The tumors were allowed to grow for 7 to 11 days until the greatest dimension reached 1.5 to 2.5 cm, when tumors were irradiated with 300 KV X-ray with a single sterilizing dose of 3000 r. Every 1, 2 or 3 days after irradiation, the tumors were excised, fixed in Baker's cold formol calcium overnight and transferred into Holt's hypertonic gum sucrose over 48 hours. The sections were cut at 7μ with cryostat. For ACP (Barka and Anderson) and β-G (Hayashi, Nakajima and Fishman) Naphthol AS-BI phosphate and glucuronide respectively were used as substrates and hexazonium pararosanilin as diazo coupling agent, and for DPNHD, a fresh frozen section of 10μ thickness was used, and DPNH as substrate and nitro blue tetrazolium as H-acceptor.

The tumor is an undifferentiated carcinoma, being made up of medium sized polyhedral cells with slightly eccentric oval or kidney shaped nuclei, moderate amount of cytoplasm and scanty stroma. Twenty four hours after irradiation, the tumor cells slightly increase in size. Mitotic figures are frequent and abnormal. On the 3rd day, they increase more in size, most of which are multinucleated. Mitotic figures are also abnormal. On the 5th day, the cells are more swollen and reduced in number. Abnormal mitosis are still encountered frequently. Thereafter, the number of tumor cells decreases rapidly. In every sections of irradiated tumors, the tumor cells with lytic changes are observed.

ACP activity is located at Golgi zone of non-irradiated tumor cells as fine closely packed particles, which in mitotic phase becomes diffuse and faint with a few scattered particles. Twenty four hours after irradiation, the activity increases slightly and begins to diffuse around the Golgi zone. On the 3rd day, the activity becomes more diffuse to the extent that the entire cytoplasm shows diffuse and weak activity, though faint granularity still remains. On the 5th day, all the tumor cells remained display faintly diffuse or no activity in the cytoplasm.

The changes in the activity and localization of β-G following irradiation are more or less similar to those of ACP, though the activity is weaker. The increase in activity at 24 hours is more distinct than in case of ACP.

In contrast with the changes in irradiated tumor cells, the cells undergoing spontaneous degeneration, especially in the center of tumor nests, disclose a different changing pattern of activity. At the border of necrotic areas, pyknotic cells display a marked and particulated activity of ACP and β-G, clearly located at the Golgi zone and faint and diffuse activity about it. The same pattern still remains even after the nuclei become unstainable.

The size of the reactive product of DPNHD slightly increases 24 hours after irradiation. After the 3rd day, some of the cells present more increasing activity as revealed by the increasing size of particles to the point that the
cytoplasm is thickly painted with the reaction product, and others show decrease. DPNHD activity in the spontaneously degenerating cells is much weaker than the control activity and shows no changes in distribution pattern.

The increase in the activities of ACP and \( \beta \)-G at 24 hours is reasonably considered to be the effect of irradiation, either due to the radiation effect on the phospholipids of lysosomal membrane, increasing its permeability, or due to functional release of lysosomal enzyme to digest radiation damaged intracytoplasmic organelles other than lysosomes. Multinucleated or mononuclear giant cells seen after the 3rd day are considered to be the results of abnormal mitosis, or of failure to attempt mitosis. Diffuse activity in these cells is assumed to be the result of continued release of lysosomal enzymes in case of interphase death during mitosis, and to be the result of failure of re-organization of the lysosome in case of death after abnormal mitosis. Both conditions may lead to the lysis of cells. The changes observed in DPNHD activity are possibly due to the swelling of mitochondria due to irradiation, and further to the increased activity of lysosomal enzymes released into the cytoplasm. The localization and intensity of the enzyme reaction products in the spontaneously degenerating cells are not modified by radiation, probably because of an increased resistance of the intracytoplasmic membranes to radiation under anoxic condition and because of protection of the membranes by coagulated proteins.

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Electron Microscopic and Electron Histochemical Studies of Prostatic Cancer Cell

K. Okada, H. Takayasu and M. Yokoyama

Department of Urology. Faculty of medicine, University of Tokyo, Tokyo

The fine ultrastructure of prostate of normal and cancer cells was studied. Intracellular site showing the activity of phosphatase by the electron histochemical method was investigated.

(1) Material and Method; Specimens for this investigations were obtained from 2 patients of nonurological disease and from 5 patients of prostatic cancer. Electron microscopic preparation was employed 1) prefixed by phosphate buffered glutaraldehyde 3) incubated in the Gomori's medium 3) postfixed with phosphate buffered osmium-tetroxide.

(2) Results and Conclusion; Normal gland: Prostatic gland lined by tall cuboidal epithelium well developed. Round or oval nuclei were present in basal region of the cell. Secretory granules contained electron dense material. Secretory vacuoles which were considered to be secreted as prostatic juice con-