

of  $^{32}\text{P}$ . The cancer tissue showed a high concentration of  $^{32}\text{P}$  in the autographic localization while the noncancerous tissue did not.

The relationship of the cancer tissue to the localization of  $^{32}\text{P}$  is under study.

## Effect of Sexual Hormones on the Uptake of Radioactive Phosphorus Into Mammary Carcinoma Tissue

— In vitro Test for Prediction of Hormone Dependency

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It has been well established that some of mammary carcinoma are dependent on hormones. According to our experience, after patients with mammary carcinoma had each been treated with endocrine ablative therapy, only half of them were effective. Therefore, the prediction of hormone dependency of individuals before definitive surgical therapy should be of great importance.

To know the hormone dependency, an in vitro test by incorporation of radioactive phosphorus into nucleic acids of breast cancer cells under the influence of estradiol- $17\beta$  and testosterone was investigated.

There were two types of mammary carcinoma classified; one was accelerated uptake of  $^{32}\text{P}$  by the administration of estradiol and effective to ablative therapy, and the other was not accelerated and ineffective.

The influences of testosterone were not so remarkable as to those observed on estradiol. In the almost cases, the reverse results were obtained.

Accordingly, this in vitro test using estradiol by the uptake of radioactive phosphorus is considered to be useful in the preoperative evaluation of hormone dependent mammary carcinoma.

## Tumor Scanning with Radioisotope Labeled Tumor Affinity Compounds

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On a scintiscan tumor is delineated as a filling defect conventionally (negative delineation) and there is some limitation in the size of the defect to be detected due to various factors. In scintigraphically positive delineation of a tumor, theoretically extremely small tumor should be detectable provided they are much more radioactive than the surrounding tissue. For this reason, a series of basic experiments has been carried out on Yoshida sarcoma-bearing rat using 27 kinds of radioisotope substances. Among these substances,  $^{131}\text{I}$ -antifibrin antibody,  $^{131}\text{I}$ -fibrinogen,  $^{131}\text{I}$ -fibrinolysate,  $^{131}\text{I}$ -albumin,  $^{99\text{m}}\text{Tc}$ -albumin,  $^{197}\text{Hg}$ -chlormerodrin,  $^{203}\text{Hg}\text{NO}_3$ ,  $^{203}\text{Hg}$ -

hematoporphyrin- $\text{Na}_2$  and  $^{131}\text{I}$ - $\gamma$ -globulin were proved to have affinity to solid tumor transplanted subcutaneously, and these several materials have the value of clinical trials. However,  $^{197}\text{Hg}$ -chlormerodrin renders the detection of deep situated lesions difficult because of marked absorption of the photons by overlying tissues. Moreover, radioactive compounds having a high affinity to the liver and kidney are not suitable for scanning of the abdominal tumor.

We have reported tumor scanning of the patients using  $^{131}\text{I}$ -RISA previously.  $^{99\text{m}}\text{Tc}$  was substituted for  $^{131}\text{I}$  as a labeling nuclide of albumin. 6 patients with cancer were

scanned immediately and 3 hours after i.v. injection of 5 mCi of  $^{99m}\text{Tc}$ -labeled human serum albumin to each of the subjects. The positive delineation was obtained in 5 cases. The scintiscan with  $^{99m}\text{Tc}$ -labeled human serum albumin was obviously superior than that with  $^{131}\text{I}$ -RISA because of the good physical properties of  $^{99m}\text{Tc}$ .

3 cases were scanned 24 hours following

i.v. injection of 700  $\mu\text{Ci}$  of  $^{203}\text{Hg}$ -hematophyrin- $\text{Na}_2$ , and 2 with good positive delineation of the tumor were shown.

Recently, 11 cases with cancer were scanned 24 hours after i.v. injection of 1 mCi of  $^{131}\text{I}$ -fibrinolysate, and satisfactory positive delineation of the tumors was demonstrated in 6 cases. While in three benign cases no accumulation of radioisotope was observed.

## Positive Scintigraphy of Tumor by Means of Intraarterial Injection of $^{131}\text{I}$ -MAA (Macro Aggregated Albumin)

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### Summary:

$^{131}\text{I}$ -MAA, 100  $\mu$  in size and 100  $\mu\text{Ci}$  per mg, was injected into the aimed artery through the Odman's catheter selectively. The dose in most cases was 250  $\mu\text{Ci}$  for carotid and bronchial arteries, 500  $\mu\text{Ci}$  for celiac, superior and inferior mesenteric, renal and internal iliac arteries. One to 5 mCi of  $^{131}\text{I}$ -MAA of high specific activity, 1000  $\mu\text{Ci}$  per mg, was also injected in some selected cases. The branches of artery should include the vascular bed of tumor. Immediate after the injection, the distribution of  $^{131}\text{I}$ -MAA was ascertained by linear and area scanning. Then, the scanning was repeated every day. In 4 to 7 days, most of the tumor were delineated.

Forty-two cases of various tumor and 3 cases of non-neoplastic disease were subjected to study.

Excellent positive scintigraphy (++) demonstrated the definitely delineated tumor; fair positive scintigraphy (+) slightly ill-

defined border of tumor or partially delineated tumor; poor positive scintigraphy ( $\pm$ ) at least higher activity on the tumor than the normal tissue; and negative scintigraphy (—) equality to the background. In tumor group, the results were as follows: (++): 23.8%, (+): 50.0%, ( $\pm$ ): 16.7% and (—): 9.5%. However, in non-neoplastic disease, all cases were negative.

In operated cases, the difference of residual radioactivity in neoplastic and normal tissues, comparison of counts per gram of each tissue, was measured by well type scintillation counter. The ratio was 4.5 times in hepatoma on second day, 10.8 times in stomach cancer on third day, 8.7 times in caecal tumor on 4th day and 22.4 times in insuloma on 4th day after the injection of  $^{131}\text{I}$ -MAA. On the other hand, in the case of duodenal ulcer the activity was 6.8 times less in the ulcer than normal duodenum on 4th day after the injection.