

measured with a Packard Tri-Carb liquid scintillation spectrometer.

The results are as follows: In L-alanine transport, controls and ligations showed equal value in all twelve rats. Mean value ($\mu\text{moles}/100\text{mg dry wt/hr}$) of controls was 28.4 ± 4.3 and that of ligations was 28.4 ± 7.0 . In L-arginine transport, mean value of controls was 11.0 ± 1.7 and that of ligations was 20.6 ± 5.0 . L-arginine transport rate of ligations was significantly higher than that of controls as statistical significant. In L-methionine transport, mean value of controls was 33.6 ± 4.7 and that of ligation was 28.4

± 6.1 . In AIB transport, mean value of controls was 10.9 ± 2.5 and that of ligations was 15.6 ± 3.9 . AIB transport rate of controls was slightly increased over that of ligations.

Recently Mizuno et al have studied albumine metabolism in hypoproteinemia, and concluded that patients with protein-losing enteropathy had remarkably high rates of albumine degradation. The rate of albumine degradation

Applicating these facts, the result of the above experiments showed that in the case of intestinal lymphangiectasia amino acid intestinal transport has adaptively and selectively been elevated.

$^{35}\text{SO}_4$ -Autoradiographic Studies on the Mucin Metabolism of the Human Gastric Epithelium

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Analysis of mucin metabolism in normal and pathologic conditions, especially in gastric cancer have recently attracted attention. We studied the mucin metabolism of non-cancerous and cancerous tissues of the human stomach in vivo using $\text{Na}_2^{35}\text{SO}_4$ -autoradiography. Comparative observations on dog and rat stomachs were also carried.

By the $^{35}\text{SO}_4$ -autoradiography of the rat stomach, an intense incorporation of sulphur is found in the generative cell zone. In the dog stomach, the incorporation was also intense in generative cell zone, moderate in pyloric glands and weak in chief cells. Observations on the migration of $^{35}\text{SO}_4$ in the dog stomach from 5 minutes till 4.75 hours showed that the labels of $^{35}\text{SO}_4$ were found at first in the supranuclear region 5 minutes after intravenous injection. The labels were rather intense in the apical region of cytoplasm at 40 minutes. Massive discharge of radioactive sulfated mucin from the cell was observed 4 hours after injection.

To observe the metabolism of sulfated mucin of the human stomach epithelium, 250 μc of $\text{Na}_2^{35}\text{SO}_4$ diluted by 5% glucose solution

was injected into the mucosa from the mucosal surface at the time of operation of gastrectomy. Removed stomach tissues were prewared. Sections were covered with nuclear emulsion or film for the autoradiography.

In the autoradiography of non-cancerous human gastric mucosa, incorporation of $^{35}\text{SO}_4$ is hardly found in the surface epithelium, generative cells, mucous neck cells and parietal cells. A weak incorporation was found in chief cells and pyloric gland. The distribution of incorporated $^{35}\text{SO}_4$ in the human stomach epithelium is markedly different from that of dog and rat. The sulfated mucin metabolism of stomach epithelium varies from one species to the other. The site of intestinal metaplasia shows strong incorporation of $^{35}\text{SO}_4$, especially columnar cells situated between goblet cells take up heavy label. On the other hand, with flash labeling there is little incorporation of $^{35}\text{SO}_4$ in the mucin droplets of goblet cell which is well stained by PAS and alcian blue. From these results, it is considered that the mucin metabolism of columnar cells is rapid and active and that of goblet cell is rather slow.

In the human gastric cancer, incorporation of the radioactive sulfate is, in general, poor. Mucocellular carcinoma shows low concentration of incorporated $^{35}\text{SO}_4$ in signet ring cells. The label is distributed diffusely in the cyto-

plasm unlike in the goblet cells in which the labels were, shortly after the labeling, concentrated in the supranuclear region of the cytoplasm.

The ^3H -Thymidine Autoradiographic Studies on the Human Stomach Epithelium (in vivo)

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The kinetics of human stomach epithelium was studied in vivo by the ^3H -Thymidine autoradiography using "local labeling method". 25 μC of ^3H -Thymidine was injected intramucosally into the pathologic region as well as the non-pathologic one. 30 minutes to 2 hours after the injection, specimens were taken out from these regions and embedded in Paraffin or Resin. Sections were examined autoradiographically. After 1 month of exposure, these sections were stained with H-E or PAS. The labeling indices in the non-pathologic areas, the margin of the stomach ulcers, the stomach polyp and the stomach cancers were about 40%, 40-60%, 35% and 20-25% respectively. In the well differentiated stomach cancer, such as a signet ring cell carcinoma, it was about 10%.

The cellular proliferation and the growth rate of tumors were analyzed on the metastases of two cases of gastric carcinoma. The ^3H -Thymidine (25 μCi) was injected into the metastatic tumors every 12 hours over the period of 6-10 days. By this cumulative labeling of ^3H -Thymidine, it was demonstrated that the generation time (tg) of these tumors was 12-12.3 days and the DNA synthesizing time (ts) was 24-32 hours. The calculation of increases in the volume of these tumors

indicated that the proliferation rate (v) was 0.056-0.058, and the growth rate (δ) was 0.012-0.038. Since a part of the proliferative cancer cells lose their proliferative activity due to the differentiation or necrosis, v larger than δ will be reasonably accepted. Therefore, in the surface spreading carcinoma, especially in the gastrointestinal tract, the growth rate is considered to be lower, for the cancer cells with the proliferative activity are pushed out, as the underlying cells increase in number. According to this point of view, one can easily understand the fact that the surface spreading early gastric cancer tends to be clinically unchanged in size for a long time. From these considerations, 3 growth patterns of the human cancer were suggested: The first pattern, $v \gg \delta$, such as a surface spreading carcinoma; The second pattern, $v \gg \delta$, such as a deeply spreading carcinoma in the parenchymal area, and; The third pattern, $v \gg \delta$, in which the tumor grows exponentially. It was concluded that ts of the human stomach cancer was twice or three times longer than that of the normal and that ts of the human stomach cancers was relatively constant, being 24-48 hours, in spite of the variety of histological patterns.