Intestinal Absorption of $^{35}$S-labeled Reduced Glutathione

K. OKUDA, Y. SHIMOKAWA and Y. KUBO

Second Department of Medicine, Kurume University School of Medicine, Kurume

Intestinal absorption of reduced form of $^{35}$S-labeled glutathione (GSH) was studied in relation to the chemical change and subsequent tissue distribution. $^{35}$SH in doses of 1—10 mg was given to rats through a gastric tube or into the jejunum or ileum by injection. Blood removed from the portal vein or the heart, and the liver, kidneys and small intestine taken at necropsy were subjected to radiometric analyses. Plasma $^{35}$SH was identified from the electrophoretic mobility using 0.02 M phosphate buffer of pH 6.9; distribution of radioactivity on paper strips was determined by placing cut pieces of paper on the bottom of the counting vial containing scintillator for beta counting. Under such conditions, direct counting of paper was only about 20% less in relative counting efficiency compared with thorough extraction from paper which is subject to much inconsistency. The radioactivities of homogenized tissues, whole plasma and protein-free plasma were also determined.

The results showed that absorption of $^{35}$SH was very rapid, about 50% being absorbed from the intestine in 5 minutes, and more than 80% of orally administered $^{35}$SH appeared in the portal blood immediately after instillation in the small intestine. Shortly after administration, a small fraction of GSH in venous blood was in its oxidized form. About 80% of $^{35}$S in plasma was precipitated with TCA after 3 hours, but no such binding to protein was demonstrated during incubation with whole blood. Radioactivities found in tissues in relation to time indicated that the liver takes up absorbed GSH very rapidly and to a greatest extent, and distribution to other tissues is slower.

Amino Acid Intestinal Transport in Intestinal Lymphangiectasia

K. MAHARA, A. ISHIHARA and S. NAITO

The Second Department of Internal Medicine, Juntendo University School of Medicine, Tokyo

During the past few years the gastrointestinal tract has been proved to play a significant role in the degradation of the plasma protein. Gastrointestinal protein loss with regard to these views has been a development of special importance. In protein-losing enteropathy, recently, indigestion and malabsorption have been demonstrated especially to fat, but it has not been investigated in detail.

Then it was determined to investigate four kinds of amino acid intestinal transport in rats with intestinal lymphangiectasia which was a major cause of protein-losing enteropathy. The albino-rats were ligated in thoracic duct and mesenteric lymphnodes and used after two weeks. These rats were tested by Gordon’s test, and intestinal protein loss was highly accounted for in ligation groups.

The experimental method employed was the perfusion technique, and the proximal 80 cm of the small intestine was used. The four amino acid were L-alanine, L-arginine, L-methionine and a-aminoisobutyric acid (AIB), and at a concentration of 5m M, each amino acid dissolved in the $^{14}$C or $^{35}$S labelled amino acid as a tracer. Radioactivity was
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 (amoles/100mg 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 hypoproteinimia, and concluded that patients with protein-losing enteropathy had remarkably high rates of albumin degradation. The rate of albumin degradation

Applying 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.

35SO4-Autoradiographic Studies on the Mucin Metabolism of the Human Gastric Epithelium

K. SHIMAMOTO, S. YAMASHITA, Y. KOHLI, T. ASHIHARA, T. KITAMURA,
Dept. Path., Kyoto Pref. Med. Univ., Kyoto

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 Na235SO4-autoradiography. Comparative observations on dog and rat stomachs were also carried.

By the 35SO4-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 35SO4 in the dog stomach from 5 minutes till 4.75 hours showed that the labels of 35SO4 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 Na235SO4 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 35SO4 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 35SO4 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 35SO4, especially columnar cells situated between goblet cells take up heavy label. On the other hand, with flash labeling there is little incorporation of 35SO4 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.