Freezing Whole Body Autoradiography of 125I-labelled Gastrin in Rats

Tatsuya MOTOKI, Yoshihisa KATO, Kazuo KAMII, Tohru MIGITA, Haruo KAMEDA, Satoru MURAO, Hiroshi KAMYAMA* and Hiromi KUROSAKI**

The 2nd Department of Internal Medicine, Faculty of Medicine, Tokyo University,
*Research Laboratories, Chugai Pharmaceutical Co., Ltd., **Daiichi Radioisotope Laboratories, Ltd.

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It is important for the elucidation of mechanism of action and metabolism of gastrin to study the affinity of this hormone to organs. In our previous report about the organ distribution of 125I-labelled synthetic human gastrin (125I-SHG) in rats¹, it has been suggested that the specifically high concentration of radioactivity could be accumulated in the kidney. To confirm the result of the last study and to investigate the findings of each organ more in detail, a freezing whole body autoradiography of 125I-SHG in rats was studied.

Material and Method

Synthetic human gastrin I (I.C.I.) was labelled with 125I by the method of Hunter & Greenwood², and the labelled product was purified with Sephadex G-10 and G-50 columns. Specific activity was 560 μCi/μg.

Forty-four μCi or 5 μCi of 125I-SHG was injected to male Wistar rats weighing 210-300 g through the tail vein. The rats were frozen in a mixture of dry ice and acetone 15 minutes; 1, 3, 6 and 12 hours after the injection respectively and stored below -20°C for more than one day. The frozen animals were applied to the preparation of the whole body sagittal section of about 40 μ thickness on a Leitz 1300 type microtome. The sections thus obtained were dried below -20°C for 5 to 7 days. Their autoradiograms were prepared using a Sakura N-type X-ray film after 7 days exposure for 44 μCi administered group or 28 days exposure for 5 μCi administered group.

Result

Satisfactory autoradiograms were taken by the administration of 44 μCi of 125I-SHG, while the dose of 5 μCi was insufficient. At 15 minutes after the injection (Figs. 1 and 2) a very high amount of radioactivity was detected in the renal cortex, while in the renal medulla only a moderate amount of radioactivity was seen. A considerable amount of radioactivity was observed along the inner layer of the glandular stomach and in the stomach cavity. In the liver, small intestine and small intestinal cavity, small degree of accumulation of radioactivity was observed.

Fig. 1 Autoradiogram of 125I-labelled synthetic human gastrin in a rat (K: kidney, S: stomach, L: liver, P: lung, I: small intestine, C: colon).
Fig. 2 Same autoradiogram as Fig. 1, showing the principal organs especially (K: kidney, S: stomach).

ty was seen. Furthermore, accumulation of radioactivity was also seen at this time in the urinary bladder cavity.

As time elapsed, the concentration of radioactivity of the renal cortex decreased rapidly and that along the inner layer of the glandular stomach increased gradually to a moderate degree. Furthermore, secretion of radioactivity into the stomach cavity increased remarkably, showing a peak at 1 hour and then decreased gradually. On the contrary, in the other organs the concentration of radioactivity showed gradual decrease.

Discussion

Various organs, such as the kidney, liver and small intestine, are regarded as the metabolic sites of gastrin. In this study, the renal cortex of rats demonstrated a specific accumulation of radioactivity after $^{125}$I-SHG injection. Since radioactive peptide hormones, such as $^{125}$I-labelled insulin, $^{125}$I-labelled luteinizing hormone and $^{125}$I-labelled growth hormone, were reported to accumulate specifically to the proximal convoluted tubules of rats, $^{125}$I-SHG is also considered to have a specific affinity to the same site of rats. This speculation might be testified on our next schedule.

While any significant accumulation of radioactivity could not be demonstrated in the stomach in our previous report on the organ distribution of $^{125}$I-SHG in rats comparing with the distribution of $^{125}$I-Na$^+$, a considerable amount of radioactivity was observed along the inner layer of the glandular stomach and in the stomach cavity in the present study. Therefore, it can not be denied that $^{125}$I-SHG may have an affinity to the gastric gland. As these findings may have some relation to an action mechanism of gastrin, further studies should be necessary to explain the difference between the radioactivity accumulated in the whole stomach and the autoradiographic distribution of the radioactivity shown transiently in the stomach wall.

Summary

A freezing whole body autoradiography of $^{125}$I-labelled synthetic human gastrin in rats was studied. Synthetic human gastrin was considered to have a specific affinity to the renal cortex. A considerable amount of radioactivity was observed to secrete into the stomach cavity through the glandular stomach, but its significance was not determined.

References