Fig. 1. Photomicrograph of sections and autoradiograms of liver of a mouse bearing ascites tumor following the intraperitoneal injection of 1.5 mg yttrium chloride containing 50 μc Y^{90}. The animal was sacrified 4 days after the injection.

was further indicated by virtue of its poor absorption after intraperitoneal injection (*3*).

Representative data on tissue distribution of intraperitoneally injected YCl_3 (*4*) are presented in Table 1. This table also demonstrates the influence of the carrier content on the distribution of Y^{90}. When the carrier content was 0.08 mg Y^{+++}, 1.4 percent of the administered Y^{90} was found in the skeleton 4 days after the injection. The skeletal uptake of Y^{90} was even less (0.02 percent of the administered Y^{90}) when the amount of yttrium carrier was 4.0 mg Y^{+++}. Autoradiograms of liver sections from animals injected with 1.5 mg of carrier yttrium show deposition of the radioisotope on the capsular surface of the liver only (Fig. 1), whereas diffuse uptake of Y^{90} by the liver is observed following the intraperitoneal injection of Y^{90} with a carrier content of 0.08 mg Y^{+++}. Thus, the autoradiograms further illustrate the influence of the added carrier upon the localization of intraperitoneally injected *ionized* Y^{90}.

Table 1. Distribution of yttrium following intraperitoneal injection of YCl_3 into Ehrlich ascites tumor mice. Activity: 50 μc Y^{90}. Y^{+++} in group A, 0.08 mg; in group B, 4.0 mg. The animals were inoculated with 0.1 ml ascites fluid. The yttrium chloride was injected 3 days later. The animals were sacrificed 4 days after the injection of Y^{90}.

Tissue	Percentage of injected dose per organ		Microcuries of Y^{90} per organ		Micrograms of Y per organ	
	A	B	A	B	A	B
Heart	0.082	0.014	0.04	0.007	0.066	0.56
Lung	.59	.053	.29	.027	.47	2.1
Muscle*	1.3	.091	.65	.046	1.04	3.6
Bone†	1.4	.018	.7	.009	1.1	0.72

* Muscle calculated as 45 percent of body weight.
† Bone calculated as 6 percent of body weight.

Distribution studies employing Y^{90} were also carried out in terminal cancer patients with pleural or peritoneal effusions. In the presence of added carrier, preferential localization of this isotope in the injected cavity has been demonstrated similar to that observed in ascites tumor mice. These data, as well as experiments on the localization of Y^{90}, when injected in unionized form, have been presented elsewhere (*5*).

References and Notes

1. D. Laszlo *et al., J. Natl. Cancer Inst.* **13**, 559 (1952).
2. R. Lewin *et al., J. Natl. Cancer Inst.* **14**, 45 (1953).
3. W. Bloom, *Histopathology of Irradiation from External and Internal Sources.* (McGraw-Hill, New York, 1948), p. 267.
4. Irradiated units containing approximately 125 mc Y^{90} and 250 mg Y_2O_3 were obtained from the Brookhaven National Laboratory. All samples were counted with an end-window counter having a sensitivity of 160,000 cpm/μc.
5. R. Lewin *et al.*, annual meeting, Am. Assoc. for Cancer Research, Apr. 1954.

Received February 1, 1954.

Succinic Dehydrogenase Inhibition in Gall-Bladder Epithelium and in Liver Cells of Pregnant Mouse

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Succinic dehydrogenase activity of gall-bladder epithelium has escaped any notice in previously published studies regarding the histochemical distribution of this essential enzyme of Krebs cycle in animals (*1–4*). Employing neotetrazolium as a histochemical indicator, I have demonstrated a fairly intense activity of succinic dehydrogenase in the gall-bladder epithelium of mouse, guinea pig, and man. The present investigation shows that succinic dehydrogenase activity is depressed in the gall-bladder epithelium and in the liver cells of the pregnant mouse.

Fifteen pregnant albino mice whose fetuses weighed 850 to 1175 mg and 15 nonpregnant littermates of them were used. Ten animals of both groups were killed after a 24-hr fasting period, and five after being fed half an hour before the decapitation. The gall bladder with a surrounding piece of liver from each pregnant animal was sectioned simultaneously with a corresponding control specimen with a freezing micro-

tome at 40 μ. The frozen sections were dipped directly from the cooled knife for 40 min into their respective incubation vials at a constant temperature of 37°C. The incubation mixture was prepared according to Seligman and Rutenburg (*1*), except that neotetrazolium was employed instead of blue tetrazolium.

In the control animals, the cytoplasm of the tall columnar cells of gall-bladder epithelium showed a deposit of fine purple granules of formazan, indicating an intense activity of succinic dehydrogenase. The densest granulation was noticeable in the basal parts of the cells corresponding to their mitochondrial arrangement (Fig. 1).

The gall-bladder epithelium of the fasting pregnant mice constantly showed a depression in the succinic dehydrogenase activity, as compared with the corresponding controls. In the fed pregnant mice, there was a moderate staining in the epithelial cells, but the granulation was sparser than in the controls (Fig. 2). Both in the nonpregnant and in the pregnant animals, the glands of the gall-bladder neck exhibited a considerable activity of succinic dehydrogenase, whereas the smooth muscle was stained only by a pale reddish hue, if at all.

In the pregnant mice, the liver was not so darkly pigmented as in the controls. The liver sections from pregnant animals displayed a monotone reddish purple color instead of the bluish purple staining with clearly demarcated lobules in the control specimens. This was due to a narrower zone of pigmentation in the periportal areas of lobules in pregnant mice and to a sparser deposition of formazan granules in the corresponding cells (Figs. 3, 4).

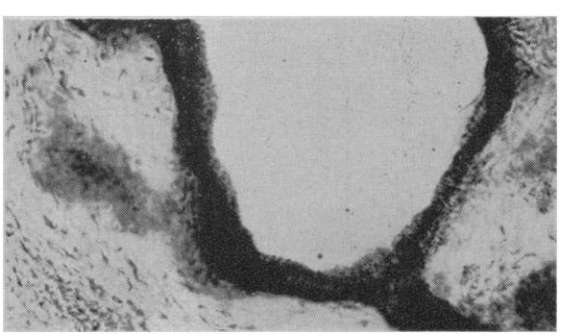

Fig. 1. Intense activity of succinic dehydrogenase in gall-bladder epithelium of a nonpregnant mouse (×250).

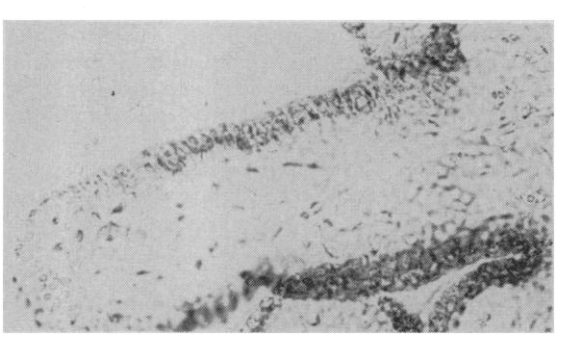

Fig. 2. Depressed activity of succinic dehydrogenase in gall-bladder epithelium of a pregnant mouse (×250).

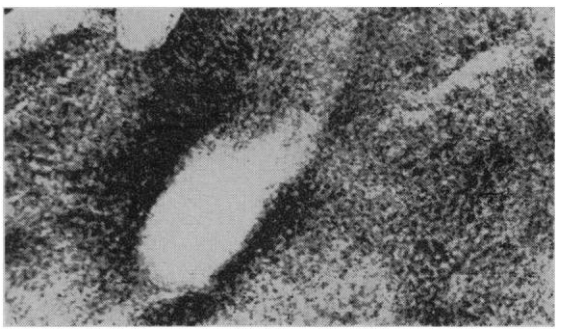

Fig. 3. High succinic dehydrogenase activity in liver of the same nonpregnant mouse as in Fig. 1 (×90).

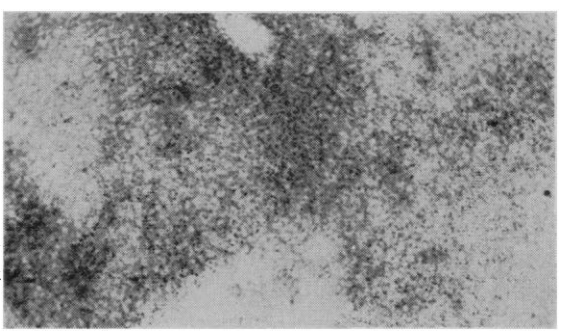

Fig. 4. Low succinic dehydrogenase activity in liver of the same pregnant mouse as in Fig. 2 (×90).

The energy for the selective concentration of bile in gall-bladder epithelium is evidently yielded by the oxidative breakdown of carbohydrates and lipids. In this chain of reactions, inhibition of succinic dehydrogenase may participate in the depression of the inspissating capacity of gall bladder in late pregnancy. The high production of estrogens, known as *in vitro* inhibitors of the succinic dehydrogenase system (*5*), may play a role in the reversible inhibition of this enzyme observed in the liver cells and in the gall-bladder epithelium. Further studies are in progress to substantiate these possibilities.

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Received January 18, 1954.