Several trials of insulin in a 20% alcohol solution produced typical hypoglycemia with dosages ½ to ⅓ those producing the same effect in saline alone. Typical hypoglycemia was produced with dosages as low as 10 units per kg., but the usual requirement is higher. The systemic effect of similar amounts of alcohol alone was demonstrated to be without influence.

The addition of lactic acid (1½ to 5%) to these mixtures does not decrease absorption and occasionally increases the effect.

Alcohol-lactic acid mixtures with insulin were introduced by catheter into one dog with a fistula anastomosed to communicate with the small gut about 50 cm. above the terminal ileum. Profound hypoglycemia leading to coma was produced with dosages of 32 and 40 units per kg. This dog, however, was in relatively poor shape and died 3 weeks after the last of these trials with partial obstruction from operatively produced adhesions.

Throughout the 35 trials in 6 dogs, the absorption effects were reasonably consistent with each individual dog although there was substantial variation between the different dogs.

We wish to thank Dr. K. K. Chen of the Lilly Research Laboratories for kindly supplying most of the insulin and to thank Dr. I. M. Gage for the operative preparation of one of the dogs.

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Roentgenologic Visualization of Lymph Nodes and Vessels by Intrapericardial Injection of Thorium Dioxide.*

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During previous experimental work on laboratory animals[1] it was noted that in the intracardiac injection of thorotrast, some of the material being injected also into the pericardium, roentgenograms

[4] Lasch and Brugel, *Arch. Exp. Path. Pharm.*, 1926, **120**, 144.

[5] Elzas, *Nederland. Tijdschr. Geneeskunde*, 1926, **70**, II, 1650.

[6] Samek, *Z. ges. Exp. Med.*, 1928, **62**, 707.

[7] Dingemanse and Laqueur, *Arch. Exp. Path. Pharm.*, 1927, **126**, 31.

* Aided by a grant from the General Baking Company.

[1] Ané, J. N., and Menville, L. J., *Am. J. Roentgenol. and Rad. Ther.*, 1932, **28**, 784.

made 24 hours after injection showed visualized mediastinal and diaphragmatic lymph glands and vessels.

The distribution of the lymphatic vessels of the heart and pericardium and the routes followed by carbon and carmine particles from these structures have been reported by many workers since the first account of Rudbeck. It is generally agreed that there are 2 main lymphatic trunks which convey lymph from the heart and pericardium. These 2 trunks, formed by major collecting channels at the origin of the coronary vessels, are designated by Kampmeier[2] as the "right" and "left" trunks, while Shore[3] considers them as the "anterior" and "posterior" trunks. While variations occur, it is believed that the right trunk generally passes anterior to the ascending aorta to enter the anterior mediastinal gland, while the left trunk, passing upward between the pulmonary artery and the left atrium, drains into the tracheo-bronchial lymph glands.

In the experiments here reported, several laboratory animals were used. Previous to injection with thorotrast, control films were made of these animals to determine the presence of any abnormality which otherwise might prove confusing on films made after injection. An attempt was made to inject the thorotrast into the pericardial cavity only, and films made immediately after injection demonstrated the presence of the opaque material within the pericardial cavity, surrounding the cardiac shadow.

Films made 24 hours after the intrapericardial injection of thorotrast demonstrated that the greater proportion of the material had been absorbed and distributed throughout the mediastinal, tracheobronchial, and diaphragmatic lymphatic glands and vessels, and a small amount remained in the pericardium. The liver and spleen were not visualized on these or subsequent films. This demonstrated that if any of the thorotrast entered the chambers of the heart, it was so slight that the organs of the reticulo-endothelial system were not visualized.

By the injection of particulate matter into the cardiac muscular wall, Kampmeier[2] confirmed the presence of deep lymphatic channels in the myocardium, which drained into the superficial or pericardial trunks. It is believed that in certain instances where we used the intrapericardial injections of thorium dioxide, it is possible that a small amount of the material was deposited in the myo-

[2] Kampmeier, Otto F., *Am. Heart J.*, 1928, **4**, 210.

[3] Shore, L. R., *J. Anat.*, 1928, **62**, 125, 291.

cardium, and if so, it drained through the deep lymphatics, entering the large trunks and eventually the lymphatic glands and vessels of the thorax. Further work on this subject is under way.

No deaths occurred nor were ill effects noted among the animals injected, all of which are in apparent good health 8 months after the injection.

These experiments serve as a radiographic demonstration of the lymphatic drainage of the pericardium, showing the routes through the anterior mediastinal and tracheo-bronchial nodes and vessels, then through the mediastinal lymphatic channels to the diaphragmatic lymphatic plexus.