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The Effects of Pancreatectomy in Ducks.

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The observations of various investigators in the field of experimental avian *diabetes mellitus,* while not agreeing in all respects are, nevertheless, unanimous in that the removal of the pancreas from chickens and ducks results in a condition which is essentially different from a von Mehring Minkowski[1] diabetes in the dog. Weintraud[2] reported glycosuria in only a small proportion of his depancreatised ducks. Kausch[3] stated that the blood sugar changes in a large series of depancreatised ducks varied from no increase at all in a few birds to an extreme hyperglycemia in the majority, but that there was no constant relation between the incidence of hyperglycemia and glycosuria in his series, and that the livers of these ducks were practically glycogen free even after heavy feeding. In a similar study on chickens, Giaja[4] reported that the removal of the pancreas resulted in no glycosuria and only a slight increase in the sugar content of the blood.

More recently, Koppányi, Ivy, Tatum and Jung[5] and Redenbaugh, Ivy and Koppányi[6] in studies on depancreatised chickens observed that while the resulting hyperglycemia was temporary it was always accompanied by glycosuria. Extracts from the livers of these chickens gave a positive iodine test for glycogen. They observed also that the pancreas of normal chickens yields approximately as much insulin as the pancreas of calves is reported to, and that the liver and kidneys of normal chickens contain relatively large amounts of insulin. In view of the atypical diabetes which results in depancreatised fowls, these workers[5] offered two possible explanations: either, that after the removal of the pancreas from fowls some other organ, probably the liver, may develop the ability to regulate carbohydrate metabolism in some unknown manner, or, that insulin

[1] v. Mehring, J., und Minkowski, O., *Centralbl. f. Klin. Med.*, 1889, x, 393.

[2] Weintraud, W., *Arch. f. Exper. Path. u. Pharm.*, 1894, xxxiv, 303.

[3] Kausch, W., *Arch. f. Exp. Path. u. Pharm.*, 1896, xxxvii, 274.

[4] Giaja, J., *Compt. Rend. de Soc. Biol.*, 1912, lxxiii, 102.

[5] Koppányi, T., Ivy, A. C., Tatum, A. L., and Jung, F. T., *Am. J. Physiol.*, 1926, lxxviii, 666.

[6] Redenbaugh, H. E., Ivy, A. C., and Koppányi, T., PROC. SOC. EXP. BIOL. AND MED., 1926, xxiii, 756.

production is not solely specific for the pancreas though the pancreas would appear to be the main producer of this hormone.

In the present study on 6 normal and 10 depancreatised ducks, we found that immediately after the pancreatectomy, the blood sugar level was definitely elevated but that it gradually returned to within normal limits of variation within a week or 10 days, and that 2 months after the pancreatectomy, the liver and muscle tissue gave a positive iodine test for glycogen. We found that extraction of liver, kidney and muscle tissue of normal ducks by the Fisher[7] modification of the Doisy, Somogyi, Shaffer[8] method of insulin preparation yielded a substance which lowered the blood sugar of fasted normal rabbits, but that similar extracts from depancreatised ducks did not.

Quantitative studies are now being made to ascertain the nature of carbohydrate metabolism in depancreatised ducks.

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Experimental Intestinal Obstruction.

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To determine the rôle of biliary, pancreatic, and duodenal secretions in the rapid death of acute intestinal obstruction an experiment was devised which permitted these three secretions to be short circuited into the bowel below the point of obstruction. This was done by operations on dogs in 2 and 3 stages, the latter giving the better results. Before producing the obstruction which was done as the last stage, the jejunum just beyond its junction with the duodenum was sectioned and the proximal portion anastomosed to the ileum. Then a pylorectomy was done and the distal portion of the jejunum was anastomosed to the stomach. In this way the duodenum emptied into the ileum, and the stomach into the jejunum.

Following this procedure the animals often lost weight, had a diarrhea, became progressively weak, and died of exhaustion or bronchopneumonia. Two developed chronic ulcers of the jejunum. Those which survived and were in good condition were obstructed by sectioning the bowel above the anastomosis in the ileum and invaginating the stumps with a purse string suture. Six dogs

[7] Fisher, N. F., *Am. J. Physiol.*, 1923, lvii, 57.

[8] Doisy, E. A., Somogyi, M., and Shaffer, P. A., *J. Biol. Chem.*, 1923, lv, 31.