the same cell manufactures both hormones. Accordingly, one would expect that if hyperplasia of these cells is brought about by a gonadal imbalance, the stimulated cells will also discharge thyrotropic hormones in excess. We are not familiar with clinical experience indicating that this is true.

If one cell produces different hormones, how is the specificity of stimulation maintained? If the induction of these pituitary growths is caused by destruction of the thyroid, would thyroidectomy also incite the development of such neoplasms? Will these conditioned neoplasms change into unconditioned neoplasms in the course of transplantation or in some hosts bearing them, as do the hyperplastic granulosa cell mass induced by the Biskind procedure(2)? Neoplastic cells are abnormal cells which frequently have a characteristically larger or smaller concentration of enzymes than their normal precursors. Will a similar dissociation occur with hormone secreting cells when they turn neoplastic? On basis of experience with liver tumors, it can be anticipated that some pituitary tumors may discharge one hormone only. Could such a dissociation be induced, or a selective depression of secretion of one hormone be brought about? It is possible, though not likely, that hosts whose thyroid had been destroyed by I^{131} are also susceptible to other neoplasms to which they are normally resistant. There are many different experiments which can be designed to answer these questions. It seems that a follow-up of Gorbman's discovery might yield new basic information concerning both the physiology of the pituitary and control of some neoplasms.

Summary. (1) Pituitary growths induced by thyroid destructive doses of I^{131} are readily transplantable in mice whose thyroid glands had been similarly destroyed, but not in normal mice. (2) These growths discharge gonadotropic hormones which in turn stimulate the production of gonadal hormones. Discharge of thyrotropic hormones by these tumors is assumed but remains to be demonstrated. (3) On the basis of observations made it is postulated that (a) the growths of the pituitary induced by thyroid destroying quantities of I^{131} are conditioned neoplasms formed by cells which are driven to proliferation through the stimulus created by the absence of TH; (b) the same chromophobe pituitary cell can discharge both gonadotropic and thyrotropic hormones.

Received August 23, 1951. P.S.E.B.M., 1951, v78.

Glucose-Utilization in Hepatectomized Dogs.* (19028)

BRUCE MACKLER,† JAMES MITHOEFER, AND GEORGE M. GUEST.

From the Children's Hospital Research Foundation and the Departments of Pediatrics and of Surgery, University of Cincinnati, O.

In experiments here reported the rate of disappearance (or utilization) of sugar from the blood in hepatectomized dogs was studied immediately after operation, by determinations of the blood-sugar levels at intervals before and after the intravenous injection of glucose solution. In eviscerated dogs Soskin and Mirsky(1) observed that the rate of disappearance of blood-sugar, expressed in percentage of initial concentrations, was constant before and after intravenous injections of glucose. Comparing the behavior of eviscerated dogs and hepatectomized dogs, DeDuve(2) estimated the rate of utilization of glucose from amounts of intravenously in-

* Aided by a grant from the Nutrition Foundation, Inc.

† Postdoctorate Research Fellow, 1948-50, National Institute of Health, U. S. Public Health Service.

1. Soskin, S., and Mirsky, I. A., *Am. J. Physiol.*, 1935, v114, 106.

2. Duve, C. de, *Compt. Rend. Soc. de Biol.*, 1947, v141, 1145.

TABLE I. Changes of Blood-Sugar in Dogs Immediately After Hepatectomy, Before and After the Intravenous Injection of Glucose. Values in mg of sugar per 100 cc of blood.

Dog No.	Min after hepatectomy					Min after administration of glucose				
	0	15	30	45	60	5*	20	35	50	65
1	67	59	51	44	37	223	170	125	103	85
2	66	55	46	40	33	282	185	156	129	110
3	95	88	76	70	64	274	208	184	163	149
4	71	61	55	50	43	243	173	144	134	123

* *i.e.*, 65 min after hepatectomy.

jected glucose that were required to maintain the blood-sugar level constant. Finding the rate of utilization faster in hepatectomized than in eviscerated dogs, DeDuve suggested that the higher rate in the dogs with simple hepatectomy was related to their ability to produce insulin. This hypothesis is supported by observations in the present experiments.

Procedures. Mongrel male and female dogs were fasted 3 days before operation, with water allowed *ad libitum*. Hepatectomy was performed by the method of Firor and Stinson (3), under nembutal anesthesia. Concentrations of glucose in venous blood were determined in duplicate, by the Nelson-Somogyi method(4), on samples drawn immediately and at 15-minute intervals for one hour following the hepatectomy. Glucose was then administered intravenously, in dosage 0.5 gram per kilogram of body weight, given in 50% solution within a period of 3 minutes, and levels of glucose in the blood were determined at the same intervals for another hour. Urine was collected at the end of each period and tested for glucose, but no glycosuria was found.

Results. Data in Table I, from experiments on four hepatectomized dogs, show the disappearance of sugar from the blood after operation during the first hour, before the injection of glucose, and in the second hour, after glucose solution was administered intravenously. The graphs in Fig. 1 represent averages of the blood-sugar values, expressed in percentage of initial levels, demonstrating a faster rate of fall after the glucose-injections. Statistical examination of the data by the method of analysis of variance(5) shows a highly significant difference ($p < .001$) between the two rates of disappearance of sugar.

Fig. 2 presents, for comparison, averages of the data originally reported by Soskin and Mirsky(1) on changes of blood sugar following evisceration (removal of liver and intestinal tract, with kidneys left *in situ* with ureters ligated) in 6 dogs, before and after the intravenous injection of glucose-solution. The latter graphs show no difference in the rates of disappearance of blood sugar before and after the administration of glucose, despite the fact that the elevated blood-sugar levels produced by injections of glucose were closely comparable to the levels produced in our experiments.

Discussion. Differences in rates of disappearance of blood-sugar before and after the administration of glucose in these hepatectomized dogs, in contrast with the absence of such differences in eviscerated animals as reported by Soskin and Mirsky(1), may be reasonably ascribed to the presence of the pancreas and its potential response. It seems probable that the intravenous injection of glucose in the animals with intact pancreases may stimulate the secretion of insulin and thus accelerate the rate of disappearance of sugar from the blood—an effect not seen in eviscerated animals from which the pancreas was removed.

Summary. In 4 *hepatectomized* dogs the rate of disappearance of glucose from the blood during the first hour after operation was slower than during a second hour, after the intravenous injection of glucose solution. This is in contrast to previously reported findings by others that in completely eviscerated dogs there is no difference in rates of dis-

3. Firor, W. M., and Stinson, E., Jr., *Bull. Johns Hopkins Hosp.*, 1929, v44, 138.

4. Nelson, N., *J. Biol. Chem.*, 1944, v153, 375.

5. Goulden, C. H., *Methods of Statistical Analysis*, 1939, New York, John Wiley and Sons, Inc.

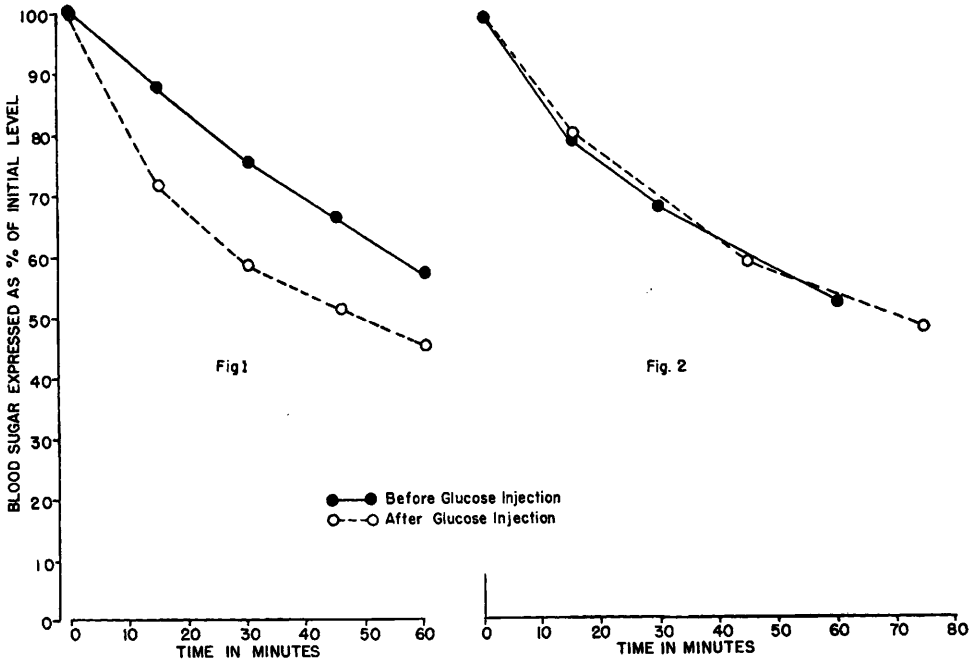

FIG. 1. Averages of blood sugar levels in 4 hepatectomized dogs before and after intravenous administration of glucose.

FIG. 2. Averages of blood sugar levels in 6 eviscerated dogs, before and after intravenous administration of glucose (experiments of Soskin and Mirsky) (1).

appearance of blood-sugar before and after the administration of glucose. The findings suggest that in hepatectomized animals the intravenous injection of glucose stimulates the secretion of insulin which accelerates the rate of removal of sugar from the blood by tissues other than liver.

Received August 23, 1951. P.S.E.B.M., 1951, v78.

Effect of Early Small Exchange Transfusion on the X-Irradiated Dog.* (19029)

SCOTT N. SWISHER AND FRANK W. FURTH. (Introduced by W. S. McCann.)

From the Department of Medicine and the Atomic Energy Project, University of Rochester School of Medicine and Dentistry.

During the course of a series of experiments on the hemolytic action of ionizing radiation, utilizing the technic of differential agglutination of erythrocytes in the dog, 4 dogs were exposed to 450 r whole body X-irradiation. Within ½-hour after completion of irradiation the dogs were rapidly bled of 250 cc and transfused with an equal volume of fresh, normal, compatible and serologically identifiable dog blood(1). The results of the studies on the fate of the transfused erythrocytes will be reported elsewhere. Although the dosage of X-irradiation given these dogs

* This study was aided partially by a contract between The University of Rochester and The Office of Naval Research, Department of the Navy (NR 131-174) and partially under a contract with The United States Atomic Energy Commission at The University of Rochester Atomic Energy Project.

1. Swisher, S. N., Izzo, M. J., and Young, L. E., unpublished observations.