

# SECRETION OF INSULIN AFTER PARTIAL PANCREATECTOMY

N. A. Raben

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Investigation of the secretion of insulin at various times after partial pancreatectomy in rats showed that the increase in insulin concentration seven days after the operation is followed by a decrease in its blood concentration on the 14th-28th days. Comparison of the blood insulin level with the intensity of its synthesis and the morphological changes in the gland (previous investigations) suggests that the relationship between the synthesis and secretion of the hormone in the early postoperative period produces a high blood insulin level, while in the later stages it produces insular deficiency, despite hypertrophy of the islet tissue.

In the early period after removal of the splenic part of the pancreas, intensification of insulin biosynthesis takes place and is accompanied by hypertrophy of the islet tissue. In the later postoperative period (after 28 days) the  $\beta$ -cells showed well-marked granulation, and normal insulin biosynthesis was restored [2]. The discrepancy between the morphological changes in the gland and the intensity of insulin biosynthesis could be the result of inhibition of secretion of the hormone.

To shed light on this problem, the blood insulin level was investigated at different times after removal of the splenic part of the pancreas.

## EXPERIMENTAL METHOD

Experiments were carried out on 26 male albino rats weighing 140-160 g. The splenic part of the pancreas was removed under superficial ether anesthesia. The animals were decapitated on the 3rd, 7th, 14th, and 28th days after the operation. The blood insulin concentration was determined by a radioimmunochemical method [3]. The kits supplied by the Radiochemical Centre (England) were used. To 0.1 ml of serum was added an equal volume of an "insulin-binding reagent" consisting of a mixture of guinea pig insulin antibodies and rabbit antibodies against guinea pig  $\gamma$ -globulin. The mixture was incubated for 6 h at 2-4°C. After addition of 0.1 ml of a solution containing 125 nCi of iodinated insulin ( $I^{125}$ ) the mixture was then left to stand for 18 h in a refrigerator. The precipitate was collected by microfiltration on membrane discs placed on a filter holder in a vacuum-filtration flask. Radioactivity was determined on a scintillation counter and expressed in pulses per minute. The insulin concentration in the samples examined was calculated from a standard curve plotted for a preparation of human insulin and expressed in microunits per milliliter.

TABLE 1. Changes in Blood Insulin Concentration after Partial Pancreatectomy

Time of investigation	Blood insulin concentration (in microunits/ml)		Change in %
	$M \pm m$	$P$	
Control	45,5 $\pm$ 4,3		
After resection:			
3 day	11,2 $\pm$ 1,8	0,001	-74
7 "	54,9 $\pm$ 2,5	0,01	+28,5
14 "	31,8 $\pm$ 1,3	0,01	-21,4
28 "	17,8 $\pm$ 1,8	0,001	-57,1

## EXPERIMENTAL RESULTS AND DISCUSSION

Data for the insulin concentration in the animals' blood at different times after partial pancreatectomy are given in Table 1.

On the 3rd day after the operation a marked decrease in the blood insulin concentration was observed. By the 7th

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day after resection the blood insulin concentration showed a sharp increase to 28.5% above the control.

In the later postoperative period a successive decrease in the insulin concentration in the blood was observed. For instance, by the 14th day the decrease was 21.4%, and by the 28th day it was 57.1% compared with the intact animals.

On the 3rd day after the operation a marked insulin deficiency had thus arisen, despite activation of biosynthesis of the hormone. Marked hypertrophy of the islets of Langerhans by the 7th day after the operation was combined with considerable intensification of insulin biosynthesis [1] and an increase in its concentration in the blood. Later (14th-28th days), however, against the background of restored normal insulin synthesis, its blood level was considerably lowered. A relative inhibition of insulin synthesis evidently took place as the result of an accumulation of insulin in the tissues of the gland because of retention of the secretion. Evidence of this was given by morphological changes in the gland, characterized by well-marked granulation of the  $\beta$ -cells.

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