

EFFECT OF TRUNCAL VAGOTOMY ON INSULIN
SECRETION AND ON THE PERIPHERAL BLOOD
PROSTAGLANDIN E₂ LEVEL IN RATSM. I. Kuzin, S. A. Morenkova,
and A. A. KarelinUDC 616.833.191-089.85-07:[616.379-
008.6+616.154;577.175.859]-074

KEY WORDS: vagotomy; sugar; insulin; prostaglandins.

The vagus nerve has a direct action on the function of the islets of Langerhans. After truncal vagotomy in dogs the myelin sheath of the intrapancreatic nerve fibers is destroyed, a decrease in the insulin content in the β -cells is found histochemically, and the reaction to injection of glucose is modified [6]. Stimulation of the vagus nerve leads to an increase in insulin secretion [4, 8, 10], whereas atropinization suppresses this effect [10, 11]. Meanwhile, there are indications that vagotomy does not change the serum insulin concentration in patients either in a fasting state or after stimulation with glucose [1, 2]. No change likewise was found in the blood insulin concentration of vagotomized rats after oral administration of glucose [7]. The role of the vagus nerve in the regulation of insulin secretion has thus not been adequately studied. The possibility cannot be ruled out that when the parasympathetic innervation is disturbed, other factors, especially biologically active substances, may restore the altered secretion of insulin.

Since operations including vagotomy have become widely adopted for the treatment of gastric and duodenal ulcers in recent times, it was decided to study the function of the pancreatic islets after this procedure. For this purpose the plasma insulin and sugar concentrations were investigated in rats after truncal vagotomy. Another important aim of the investigation was to study the concentrations of prostaglandins of the E group (PGE₂), for these biologically active compounds, which inhibit gastric secretion, may prevent ulcer formation and, in addition, may modify insulin metabolism [5].

EXPERIMENTAL METHOD

Experiments were carried out on male rats weighing 150–180 g. Subdiaphragmatic truncal vagotomy was performed under ether anesthesia. Animals undergoing a mock operation were used as the control. The rats were taken for investigation before taking food on the 2nd and 14th days.

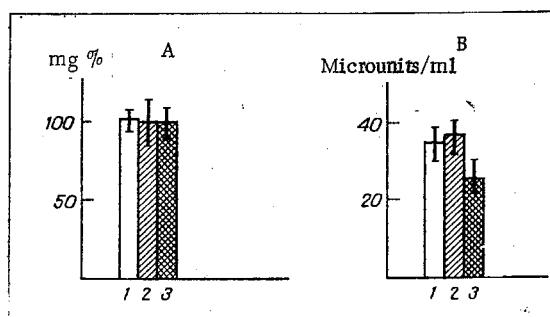


Fig. 1. Peripheral blood sugar (A) and insulin (B) levels after truncal vagotomy. Here and in Fig. 2: 1) animals undergoing mock operation; 2) 2nd day after vagotomy; 3) 14th day after vagotomy.

Laboratory of Biochemistry, A. V. Vishnevskii Institute of Surgery, Academy of Medical Sciences of the USSR, Moscow. Translated from *Byulleten' Éksperimental'noi Biologii i Meditsiny*, Vol. 89, No. 4, pp. 400–401, April, 1980. Original article submitted December 28, 1978.

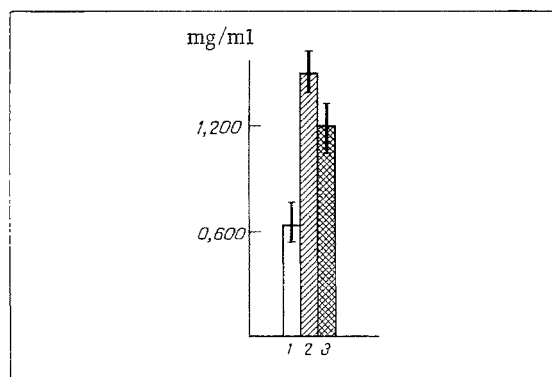


Fig. 2. PGE₂ level in peripheral blood plasma after truncal vagotomy.

The blood sugar was determined by the glucose oxidase method and insulin by radio-immunoassay using standard kits from "Sorin."

PGE₂ were identified by column chromatography [3] and then estimated quantitatively by radioimmunoassay using standard kits from "Clinical Assays."

EXPERIMENTAL RESULTS

As Fig. 1 shows, the blood sugar concentration was unchanged after vagotomy. The insulin concentration on the 2nd day after the operation was similar to that in animals undergoing the mock operation, but fell a little by the 14th day, although it still remained within normal physiological limits.

The PGE₂ concentration (Fig. 2) in the plasma of the vagotomized animals was considerably increased on the 2nd day but reduced a little on the 14th day, although it did not reach the level in the rats undergoing the mock operation.

It can be concluded from these results that the function of the pancreatic islets of the rats was undisturbed during the period of investigation after vagotomy: The insulin secreted maintained normoglycemia in these animals. The absence of any fall in the insulin content in the β -cells on the 7th and 14th days after subdiaphragmatic vagotomy has also been demonstrated histochemically [9]. It will also be evident from the results of the present experiment that PGE₂ do not inhibit insulin secretion, for the sharp increase in their concentration on the 2nd day did not change the insulin level compared with that found in the rats undergoing the mock operation, and on the 14th day, when the PGE₂ level was lower than on the 2nd day, the insulin content also was reduced. The fact that PGE₂ are increased after vagotomy must be regarded as a beneficial effect on this operation, for in gastric and duodenal ulcers it is necessary to inhibit gastric secretion, and PGE₂ have this property [5]. Increased PGE₂ production after vagotomy may perhaps impose the necessity for their exogenous administration when vagotomy is performed for the treatment of gastric and duodenal ulcers.

LITERATURE CITED

1. M. M. Kuzin, E. P. Gitel', and P. M. Potolov, *Vestn. Khir.*, No. 7, 3 (1978).
2. P. Aagaard, T. Deckert, and H. J. Fenger, *Scand. J. Gastroent.*, **8**, 699 (1973).
3. F. J. Auletta, R. M. Zusman, and B. V. Coldwell, *Clin. Chem.*, **20**, 1580 (1974).
4. R. N. Bergman and R. E. Miller, *Am. J. Physiol.*, **225**, 481 (1973).
5. T. P. Dousa and R. R. Doris, *Gastroenterology*, **73**, 904 (1977).
6. U. Fisher, H. Hommel, W. Nowak, et al., *Acta Biol. Med. Germ.*, **35**, 1279 (1976).
7. F. Hollander, *Meth. Med. Res.*, **4**, 166 (1951).
8. A. Kaneto, E. Miki, and K. Kosaka, *Endocrinology*, **95**, 1005 (1974).
9. V. D. Lorenz, J. Petermann, A. Dorn, et al., *Acta Histochem. (Jena)*, **49**, 51 (1974).
10. J. Porte, J. Lucien Girardier, J. Seydoux, et al., *J. Clin. Invest.*, **52**, 210 (1973).
11. S. C. Woods, *Am. J. Physiol.*, **233**, 1424 (1972).