Are Langerhans's Islets Influenced by the Pineal Body?

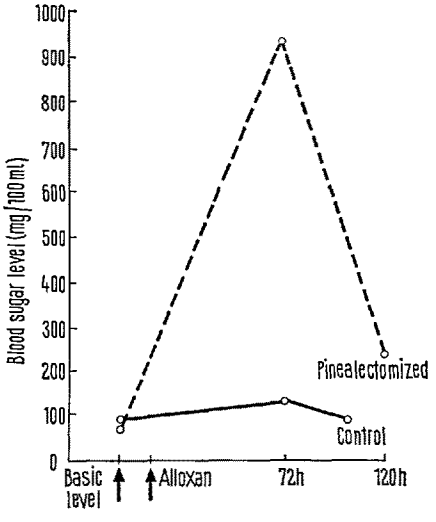
In our previous investigations[1-4] we demonstrated the influence of the pineal body on the thyroid and parathyroid activity. Thus the pineal body can be considered[5] as the regulator of the endocrine glands having entodermal origin. These glands, except the thyroid, are not hypophyseally regulated. The Langerhans's islets of the pancreas are also originated from the entoderm, their hypophyseal regulation is unknown; thus it can be supposed that the pineal body has an influence on the activity of these organs also.

To demonstrate this conception investigations were carried out on 44 Wistar male rats weighing 200 g. 29 animals were pinealectomized (the effectiveness of the operation was controlled by dissection at the end of the investigations), while the shame-operated and normal control groups consisted of 15 animals. In the 4th month after the operation, blood was taken from the tails of the animals. The basic blood sugar concentration was estimated by ortotoluidine method[6] in a Spekol (Zeiss) colorimeter on 620 nm. After 16 h fasting, the animals received 200 mg/kg body weight alloxan (Reanal) i.p. After the administration of the alloxan the 72- and 120 h samples were estimated again.

The mean blood sugar levels of the control animals were 93 mg/100 ml. There was no difference between the values of the shame-operated and control groups, while those of the pinealectomized group were 71 mg/100 ml (Table). 72 h after the administration of the alloxan – at the probable top of the diabetes-like state with hyperglycaemia[7,8] – the blood sugar levels of the control animals were only 131 mg/100 ml, while the mean value of the pinealectomized ones increased to 933 mg/100 ml. 48 h later, the blood sugar levels of the control group has been normalized, while those of the experimental group have remained on 234 mg/100 ml level (Figure). The mathematical analysis was carried out by Students *t*-test and the differences were highly significant.

Effect of pinealectomy on the blood sugar level of normal and alloxan treated animals

	Basic level (mg/100 ml)	After alloxan treatment 72 h	120 h
Control	93	131	99
Pinealectomized	71	933	234
Significance	$p < 0.01$	$p < 0.01$	$p < 0.01$



The blood sugar levels of the pinealectomized and control animals.

The first conclusion of our experiments is that the pineal body has a significant influence on the blood sugar level, and consequently on the activity of the Langerhans's islets. It is possible that this diminishing effect on the blood sugar level is a circumstantial one, but – knowing the direct influence of alloxan on the β-cells[8-10] – the effect of pinealectomy on the acute 'alloxan diabetes' can be accepted as a direct effect. This effect is probably due to the stimulation of the β-cells; it is in accordance with the decreased level of the blood sugar. It seems the pinealectomy also sensitizes the β-cells for the influence of the alloxan. Consequently, the β-cells suffer more severe and durable injuries in the operated animals. This last supposition has still to be histologically confirmed.

If it is permitted to draw back conclusions about the effect of the pineal body on the Langerhans's islets by the effect of the pinealectomy on it, the only way is that pineal body suppresses the activity of the β-cells. The increased activity after the exstirpation can be estimated as a releasing phenomenon. The pineal body has similar activity in relation to the thyroid gland: the melatonin inhibits the iodine uptake[11], while pinealectomy is stimulating it[3].

The phenomenon described supports our earlier observations about the regulatory activity of the pineal body on the endocrine glands having entodermal origin.

Résumé. Après l'extirpation du corps pinéal, le niveau de sucre du sang a diminué au bout de 4 mois d'une manière significative. Après un seul traitement à l'alloxane le niveau du sucre du sang des animaux opérés augmente considérablement et la diminution consecutive est beaucoup plus lente que chez les animaux de contrôle.

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