Short communication

Identification of neuroendocrine oxytocic activity of the human fetal thymus

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Investigating the endocrine properties of the human fetal thymus during the gestational period, we found that it had oxytocic activity, that is, it produced oxytocin – a neurohormone which is involved in smooth muscle activity of the male and female reproductive tract [8,9].

Oxytocin consists of the peptide chain incorporating 9 amino acids and is produced in the neurosecretory cell granules of the paraventricular and supraoptic region nuclei [10,12].

The most recent data indicate that oxytocin can be formed in the epithelial cells of the thymus neuroendocrine cortical zone. In the secretory granules of this cell substrate, oxytocin and binding protein-neurophysin were histochemically found. The thymus nurse cells (TNC) involved in the oxytocin synthesis have also been found in the same layer, in thymus microenvironment [1]. The immune and neuroendocrine systems appear to be able to communicate with each other by virtue of the signal molecules (hormones) and receptors common to both systems. Thus oxytocin and vasopressin are capable of replacing the interleukin 2 (IL2) requirement for the interferon (INF-γ) production in cell cultures [7].

Therefore, we investigated the production and concentrations of oxytocin in the cell substrates of the human fetal thymus during the gestation (9 cases) and in the immediate neonatal period (2 cases). Thymus glands were obtained from the fetuses and the newborns in the post mortem autopsy after spontaneous abortion or delivery.

The methodology of the oxytocin activity determination of the thymus extract, prepared from the fetal (neonatal) thymus samples comprised:
1) The quantitative bioassay [6]. This method is based on the uterine contraction registration on the isolated nonpregnant animal uterus. The calculation
depends on the assumption that the height of contraction bears a linear relation to the dose of the oxytocin.

II) The estimation of the fowl’s blood pressure [11]. The oxytocin (standard) produces a significant fall of blood pressure (20–40 mmHg) in the anesthetized bird of a particular weight (1750 grams). The fetal (neonatal) thymus extract was applied parenterally (a. femoralis) and the effects on the blood pressure in relation to the oxytocin standard were monitored.

III). The administration of oxytocin (standard) and the human fetal (neonatal) thymus extract to pregnant rats. In particular concentrations this administration caused material contractions which resulted in abortion or parturition in the experimental animals.

Identical methods have been used for the comparative determination of the oxytocic activity in the animal juvenile calf thymus extract.

Results

The obtained oxytocin values by the quantitative bioassay indicate the oxytocin production in the human fetal thymus extract samples in the second half of the gestation (Fig. 1).

By the estimation on the fowl’s blood pressure method, the oxytocin values in the human fetal thymus extract show a significant increase with the fetal gestational progression (FTH), being highest in the postpartal period (NTH) (Fig. 2).
Fig. 2. Estimation of oxytocic activity on the Fowl’s blood pressure.

Fig. 3. Administration of oxytocin (st), fetal thymus (FTH) and juvenile calf thymus (JCTH) extracts to the pregnant rats — effects on uterine contractility.

The effects of the fetal thymus extract administration in concentrations (2.0 ml) to pregnant rats indicate a significant presence of the oxytocic activity in the investigated thymus extract. Maternal uterine contractions occurred and were followed by abortion or parturition in the time interval of 6 to 24 hours (Fig. 3).

The results of the oxytocic activity comparative investigations in the extract samples of the juvenile calf thymus by the same methods, present a significant-
ly expressed synthesis of this neurohormone in the early phase of the animal extrauterine life. The oxytocic effects were especially pronounced after the administration of the juvenile calf thymus in the myometrium activity of pregnant experimental animals.

Our results also present the dose response effects to the FTH, NTH and JCTH.

**Discussion**

Contemporary opinion, on the basis of the clinical, experimental and laboratory findings, is that the initial signal for the delivery onset is based on the oxytocin production in the fetal hypophysal posterior lobe, initiating the complex chain of endocrine reactions in the fetal neuroendocrine system, as well as in the maternal, with the effectory uterine organ – myometrium [3]. Oxytocin-neurophysin values are higher in the umbilical artery than in the vein during the labour, which indicates dominant production in the fetal endocrine regions in relation to the maternal, where the oxytocin levels are relatively lower [2].

The proven oxytocin production in the cell substrate of the human fetal thymus supports the suggestion of a thymic-hypothalamic-pituitary-gonadal axis [4, 5].

Our hypothesis that the fetal thymus is also incorporated in the mechanism of the delivery initiation, could be of use in the further investigations of the physiology and pathology of human reproduction.

**References**

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