

A Possible New Approach to the Postmenopausal Osteoporosis Treatment with Calcitonin Originating from the Human Fetal, Neonatal and Juvenile Calf Thymus

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Abstract : *Thymus is, according to the contemporary opinion, a part of the hypothalamus-pituitary-thymus-gonadal axis and participates in the regulation and modulation of the endocrine reproductive function in humans. We studied the endocrine properties of the thymic gland and found that it contained significant calcitonin activity in the specimens of the human fetal and neonatal thymus as well as in the juvenile calf thymus. We stress on the interesting fact that calcitonin presence in the human fetal and neonatal thymus is in correlation with calcitonin levels in human neonatal umbilical cord. Application of thymic extracts with calcitonin activity presents the possibility of a new therapeutical approach to osteoporosis. (Thai J Obstet Gynaecol 1993;4:135-138.)*

Key words : calcitonin, thymus, postmenopausal osteoporosis

Calcitonin is a polypeptide hormone which in mammals is produced by parafollicular C cells of the thyroid gland. It contains 32 AA, molecular weight approximately 3500 D⁽¹⁾. Its role in the development, prevention, and treatment of osteoporosis has been highlighted during the past few years. Calcitonin presents a strong hypocalcemic effect and the property to inhibit osteoclasts activity, thus

preventing bone resorption, which is of the special importance in the postmenopausal period⁽²⁻⁶⁾. So, calcitonin administration inhibits bone resorption by a direct action on the activity of the osteoclasts. Long-term treatment with calcitonin seems not only to inhibit osteoclasts activity, but also to decrease their number. Investigations of endocrinological properties of the human fetal (FTH) and neonatal

thymus (NTH) confirmed the production of calcitonin⁽⁷⁻⁹⁾.

According to the contemporary opinion, thymus is part of the hypothalamus-pituitary-thymus-gonadal axis and participates in the regulation and modulation of the endocrine reproductive function in humans^(10,11). We studied the endocrine properties of the thymic gland and found that it contained significant calcitonin activity in the specimens of the human fetal, neonatal, as well as in the juvenile calf thymus (JCTH).

In the thymus gland many different hormones have been localized, including oxytocin, vasopressin, beta-endorphins, etc.⁽¹¹⁻¹³⁾. Contemporary investigations of the thymic vascular pattern confirmed that this gland can be of special importance in the production of a great variety of other hormones⁽¹⁴⁾. The aim of this study was to confirm calcitonin production in the human fetal and neonatal thymus as well as in the juvenile calf thymus gland.

Materials and Methods

This study was performed in collaboration with the Department of Clinical Pathology of Gynaecology and Obstetrics Clinic, University Clinical Center in Belgrade, Institute for Thymus Research, Bad Harzburg, Germany and Institute of Anatomy, School of Medicine, Belgrade, Yugoslavia. We determined the concentrations of calcitonin in human fetal (n=3) and neonatal (n=3) thymus au-

topsy specimens obtained immediately after spontaneous preterm labour and delivery by using the method of quantitative bioassay on experimental animals (rats, n=20) after administration of FTH, NTH and JCTH. Concentrations of calcitonin were estimated by the method of photometry on LP 400/s (Lange test). Obtained data were expressed (mean) in IU/mg of thymus wet tissue weight that were also calculated in ng/l. Calcitonin concentrations were also determined in human neonatal cord blood specimens (n=20).

Results

Calcitonin bioactivity was found in FTH (0.40 IU/mg wtw or 93.60 ng/l) and NTH (0.43 mg wtw or 100.62 ng/l). These findings were expressed in JCTH (0.39 IU wtw or 91.26 ng/l) showing also significant activity in the animal thymus gland (Fig. 1).

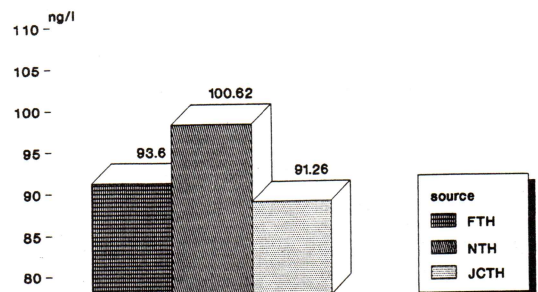


Fig. 1 Calcitonin activity in thymus.

We stress on the interesting fact that calcitonin presence in the

FTH, NTH and JCTH is in correlation with calcitonin levels in umbilical human neonatal cord (87.5 ng/l).

Discussion

The presence of hormones in thymus and their endocrinological function has not been systematically investigated until now. The immune and endocrine system appear to be able to communicate with each other by the signal hormonal molecules and receptors common to both systems⁽¹²⁾. Thus, the thymic extract administration in experimental animal conditions unevenly increases calcium and phosphorus levels in all the bones most notably in the long bones and demonstrates the positive influence of thymus in ossification processes. It is of possible interest, the relationship between thymic and parathyroid gland as well as the influence of thymic peptides on PTH levels.

Thymic calcitonin production was confirmed 25 years ago by Galante and Gudmundson⁽¹⁵⁾. In the following years, calcitonin receptors were discovered in cellular substrates of CNS, hypophysis, and the lymphoid system, etc.. The obtained results in this study could suggest that the identified calcitonin production in the endocrine zone of thymus gland represent the important factor in the regulation of calcium bone metabolism in the fetal and neonatal period as well as in the other life periods. Whilst oestrogen is the preferred treatment in postmenopausal patients,

calcitonin as an antiresorptive drug has been experimentally shown to be of use in women who do not wish to experience withdrawal bleeding. Application of thymic extracts with calcitonin activity presents the possibility of a new therapeutical approach to postmenopausal osteoporosis. Women who have established osteoporosis can be offered a number of treatments which appear to be effective in preventing further bone loss and restoring bone formation.

Endocrinology of the thymus gland requires further investigation in order to obtain a definitive exact insight in human reproduction especially in the processes of protection against osteoporosis in the postmenopausal period.

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