ABSTRACTS

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Development of foetal and alteration of maternal endocrine functions in pregnant dogs

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OBJECTIVES AND METHODS: Pregnancy of mammals induces endocrine and metabolic changes in maternal organism parallel with development and initiated function of foetal endocrine organs. Synchronised maternal endocrine functions and development of foetal thyroid, adrenal glands and endocrine pancreas are essential for complete foetal growth and coordinated process of parturition.

Aim of our study was to reveal relations among interactions of maternal metabolism, foetal development of endocrine organs and role of different foetal membranes.

P₄, estradiol, T₄, T₃, cortisol, glucose and insulin concentrations in blood samples of pregnant bitches went through ovariohysterectomy requested by the owners and same parameters in blood, allantois and amnion fluid of removed foetuses were statistically compared with same parameters of healthy pregnant and non-pregnant bitches. Results of twenty four pregnant bitches and their foetuses were compared with fifteen controls beagles. Samples were collected before induction of narcosis and directly after remove of pregnant uterus. Allantois and amnion fluids were collected strictly separated and foetal blood was collected by heart puncture. Maternal and foetal blood glucose was measured in time of collection and glucose concentration of foetal fluids was measured by GOD/PAP colorimetric method. T₄, T₃, cortisol and estradiol were measured ELISA kits of DRG (DRG Instruments GmbH, Marburg, Germany), insulin was measured by Canine Insulin ELISA (Mercodia AB, Uppsala, Sweden) and P₄ was measured by QuantiCheck (SzIE, Budapest, Hungary). Control samples were weekly collected from pregnant beagles and non-pregnant beagles in luteal phase. Data were analysed by STATISTICA v.10 (US) software.

The animals were kept and treated in compliance with all applicable sections of the Hungarian Laws No. XXVIII/1998 and LXVII/2002 on the protection and welfare of animals and animal welfare directions and regulations of the European Union.

RESULTS: Although maternal glucose levels balanced continuously in physiologic range, foetal glucose concentrations scattered in a wide range between 2.8-21.9 mmol/l. Glucose concentrations of foetal fluids were lower than either maternal or foetal serum but insulin level was the highest in allantois fluid at level of significance.

A moderate increase of maternal T₄ concentration was noticed between 30th - 40th days of pregnancy which phenomenon was absent in control non-pregnant group. T₄ production of foetal thyroid glands rapidly increases after 30th day of foetal life, but it does not reached the maternal serum concentration until end of pregnancy. T₄ level of allantois and amnion fluids turned to advantage of allantois in second half of pregnancy. Maternal and foetal serum T₃ concentrations did not differ at level of significance.

Although cortisol concentration of amnion was slightly less than concentration in allantois but foetal serum cortisol concentration was higher than maternal and foetal fluid compartments at level of significance. Increase of foetal cortisol concentration was more characteristic approaches to parturition.

CONCLUSION: Development of foetal endocrine organs is modulated by maternal metabolism which process influenced by placenta as an endocrine active barrier. Onset of foetal endocrine function is compensated by maternal effects. Distinct concentration gradient of T₄ is observable from mother to foetus but in contrast with human results, T₃ level does not differ at level of significance (1).

Foetal hyperglycaemia is essential to avoid malformation of CNS (2). Our results demonstrate an independent GNG pathway during foetal life as source of increased glucose level in foetal serum. Although glucose molecule is small and endotheliochorial placenta indicates a close connection between mother and foetus, flow gradient show in maternal-foetal direction. In conformity to human studies, our results indicate suspected insulin production of foetal membranes (3).

Continuous increase of foetal cortisol concentration concords with previous studies.