Effects of maternal dexamethasone treatment on pituitary FSH and LH cells in rat neonatal offspring

N. Ristić, M. Manojlović-Stojanoski, N. Nestorović, V. Ajdžanović, S. Trifunović, B. Filipović, V. Milošević, M. Sekulić

Department of Cytology, Institute for Biological Research „Siniša Stanković“ Belgrade, 11060, Serbia

manojlo@ibiss.bg.ac.rs
Keywords: FSH cells, LH cells, pituitary, dexamethasone, phisical fractionator

Glucocorticoids acting as nutritional and maturational signals control many aspects of fetal development in preparation for extrauterine life [1]. Synthetic glucocotricoid dexamethasone (Dx) is widely used drug in obstetric practice when a risk of preterm delivery persists. It has been known that prenatal glucocorticoide administration may influence postnatal development in various physiologoical systems and induced endocrine changes [2]. The aim of this study was to examine the effects of maternal Dx administration during late pregnancy on pituitary FSH and LH cell development and differentiation in neonatal 5-day-old rat offspring. Stereological methods, Cavalieri's principle and physical fractionator design [3] was used for determination of pituitary volume, FSH and LH cell volume and number, as well as volume and numerical density.

On 16^{th} day of pregnancy experimental dams received subcutaneously 1.0 mg Dx /kg b.w., followed by 0.5 mg Dx/kg b.w./day on 17^{th} and 18^{th} days of gestation. The control gravid females received the same volume of saline vehicle. Female pups from control and experimental females were sacrificed under ethar narcosis on the 5^{th} day of life. The pituitary glands were excised with part of the sphenoid bone, fixed in Bouin's solution for 48 h and dehydrated in increasing concentrations of ethanol and xylene. After embedding in Histowax, tissue blocks were serially sectioned at 3 μm thickness on a rotary microtome. Every 10^{th} section from each tissue block was immunocytochemically stained by the PAP method and analyzed (the same sections were used in subsequent estimation of FSH or LH cell numbers by the physical disector method). The random number for each block being analyzed was taken from the random number table. The fetal pituitary volumes (V_{ref}) and FSH and LH volume densities (V_V) were estimated using Cavalieri's principle. A physical disector counting technique in combination with the fractionator sampling method was used for estimation of absolute FSH and LH cell number (No) per pituitary. The volume of FSH and LH cells (V_{cell}) was estimated as the product of V_{ref} and the apsolute number of cells.

The gonadotrophic cells were regularly distributed throughout the pars distalis. Maternal Dx application was found to cause a significant decrease of pituitary volume and absolute number of FSH and LH cells in 5-day-old rat offspring in comparison to the control neonatal pups. Also, FSH and LH volume density was decreased significantly after maternal Dx administration. However, numerical density (N_V), number of cells per volume unit, and volume of FSH and LH cells did not differ significantly from the control group.

It can be concluded that exposure to glucocorticoids during fetal development influenced number of gonadotrophic cells as well as pituitary volume in neonatal offspring. It remains to be established whether the decline of FSH and LH cell number after maternal Dx application might have long lasting consequences.

M.A. Pabst, G. Zellnig (Eds.): MC2009, Vol. 2: Life Sciences,
DOI: 10.3217/978-3-85125-062-6-266, © Verlag der TU Graz 2009

1. A.L. Fowden, A.J. Forhead. Reproduction **127** (2004) p515-526.
2. H.J. Gundersen. J Microsc. **143** (1986) p3-45.
3. J.T. Smith, B.J. Waddell. Endocrinology **141** (2000) p2422- 2428.
4. This work was supported by the Ministry for Science and Environmental Protection of Republic Serbia, Grant number 143007B.

	groups	No	V_V (%)	N_V (mm^{-3})	V_{cell} (μm^3)	V_{ref} (mm^3)
LH cells	C	21200±1873	9.587±0.116	9.7E-05 ± 6.4E-06	987.2±59.9	0.2726±0.0037
	Dx	14600±1664*	8.139±0.390*	8.1E-05 ± 1.1E-05	1006.4±113.9	0.2337±0.0085*
FSH cells	C	18567±2079	8.436±0.579	8.5E-05 ± 9.0E-06	991.9±42.6	0.2726±0.0037
	Dx	13000±436*	6.652±0.647*	7.2E-05 ± 4.1E-06	1049.9±70.7	0.2337±0.0085*

All results are expressed as means for six animals per group ± SD. *****, $p<0.05$ vs. C.

Figure 1. Stereological parameters of FSH and LH cells in 5-day-old offspring after maternal treatment with Dx (Dx) or saline (C).

DOI: 10.3217/978-3-85125-062-6-266,