Abstract

The development and entrainment of fetal suprachiasmatic nuclei (SCN) are controlled by maternal cues, including hormones that cross through the placenta in a circadian rhythm. A recent study highlighted the effect of glucocorticoids (GC) on fetal SCN both *in vitro* and *in vivo*, where the application of the synthetic glucocorticoid, dexamethasone (DEX) *in vivo* regulated the *c-Fos* gene expression (Čečmanová et al., 2019). Using organotypic SCN explants from embryonic day 17 (E17) of a transgenic *mPer2*^{Luc} mouse model, this research built on the initial study to further elucidate the action of GC upon in vitro application. Real-time recording of PER2-bioluminescence in E17 SCN explants confirmed that DEX increases the amplitude of E17 SCN explants, and DEX application at CT 15-18 leads to a phase advance of the rhythm. The specificity of the DEX effect was confirmed by application of the glucocorticoid receptor antagonist, mifepristone. Inhibition of the protein kinase A and C signalling pathways, which regulate *c-Fos* gene expression had no effect on DEX action *in vitro* in E17 SCN explants. No effect of DEX on PER2 protein turnover was observed. Using a newly optimized RNA isolation method followed by RT-qPCR, an increased level of *c-Fos* was detected in E17 SCN explants 1h after DEX application at CT 16 compared to the VEH control group, while this difference was not observed when DEX was applied at CT 4. After 3h of DEX application at CT 16, no increased level of *c-Fos* was detected in DEX-treated explants compared to VEH-treated explants. For the other genes tested, namely *Vip, Nr3c1, Fkbp5, Sgk1, Per1, Per2* and *E4bp4*, DEX had no effect when applied at CT 4 or CT 16 after 1h or 3h of exposure.

Key words: fetus, glucocorticoids, suprachiasmatic nuclei, circadian clock, synchronization