Background and aim: Perinatal asphyxia is a major cause of neonatal mortality and morbidity. Research has shown that in rats fetal asphyxia (FA) can provoke neuroprotection against a subsequent more severe perinatal asphyctic insult (PA). This is called fetal asphyctic preconditioning (PC). However, the exact mechanisms are not yet elucidated. Since the placenta is also subjected to the asphyctic insult, we aimed to investigate the placental inflammatory response.

Method: PC was induced in the rat at embryonic day (E) 17 by clamping the uterine circulation for 30 minutes. PA was induced at E21 by submerging the uterine horns in saline for 19 minutes. Placental TNF-α, IL-1β, IL-6 and IL-10 mRNA levels and protein concentrations were measured by qPCR and ELISA in prenatal and labouring placentas of the control, FA, PA and FA+PA (PC) groups. Results: IL-1β mRNA increased in the labouring FA group, but IL-1β protein concentrations decreased in both the FA and PA group. IL-6 protein concentrations increased 6 h after FA, although 24 h after these levels decreased. In the labouring placentas IL-6 mRNA levels were higher in the PA group than in control, FA and PC placentas. IL-10 protein concentrations decreased 24 h after FA. At birth, IL-10 mRNA levels were increased in the PA group, however protein levels decreased in both the PA and the FA group. In the PC group IL-10 protein concentrations were similar to those of controls.

Conclusions: Depleted protein concentrations of the anti-inflammatory cytokine IL-10 after one single asphyctic insult were preserved in fetal asphyctic PC. In addition, PC placenta showed less upregulation of IL-6 compared to the PA placenta. This modulated placental inflammatory response might contribute to the improved fetal tolerance and neuroprotection showed after fetal asphyctic PC (FA+PA).