061

FETAL CARDIAC ARREST DUE TO ASPHYXIA IN LATE PRETERM LAMBS: PROPOFOL MEDIATES NEUROPROTECTION FOR THE FETUS WHEN ADMINISTERED DURING EMERGENCY CAESAREAN SECTION AND AFTER RESCUSITATION

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Background and aims: Preterm and term-born infants suffering from severe perinatal asphyxia resulting in cardiac arrest are at high risk to develop brain injury and life-long disability. Until now, there is no therapy available to reduce severe cerebral injury in preterm infants. We hypothesized that propofol administration to the maternal-fetal-unit can diminish injury in preterm fetuses in states of progressive severe asphyxia.

Methods: 44 late preterm lambs underwent standardized total umbilical cord occlusion (UCO) or sham-treatment in utero. UCO resulted in global asphyxia and cardiac arrest. After emergency Caesarean section under either propofol or isoflurane maternal anaesthesia the fetuses were resuscitated and anaesthetized the same way as their mothers. EEG measurements were performed in utero, during UCO and postnatally during 8 hours of ventilation. Occurrence of apoptosis, reactive oxygen species (ROS) formation, and protein levels of GABA- and NMDA receptors were determined in fetal cerebral frontal cortex.

Results: Lambs receiving isoflurane anaesthesia showed a profound increase of total spectral power in burst epochs (estimate for seizure activity) and marked increase of interburst intervals during UCO (more suppression), whilst lambs receiving propofol anaesthesia showed less EEG changes. Propofol treatment reduced cerebral ROS formation and protein levels of activated caspase-3, GABA- and NMDA-R after severe asphyxia.

Conclusions: Perinatal neuroprotection in the ovine maternal-fetal-unit can be achieved by pre- and postconditioning with propofol. The underlying mechanism is probably an avoidance of lipid peroxidation by ROS scavenging and the reduction of glutamate induced cytotoxicity by downregulation of NMDA receptors.