Very preterm infants (VPI) are exposed to atypical and intense light levels in the Neonatal Intensive Care Unit. We conducted this prospective observational study to better understand very preterm infants' responses to light level variations in their incubator and to evaluate the determinants of their reactivity.

Methods A total of 27 VPI were studied in their incubator during 10 h. We analysed their physiological responses: Heart rate (HR), respiratory rate (RR), systemic saturation (SaO_2), regional cerebral saturation (rSO_2) and fractional oxygen extraction (FOE) following variations (10 to 50 lux, > 50 lux above baseline) of their light level environment, measured concomitantly on the same time scale.

Results A total of 332 light level changes were identified and analysed. An increase in HR (+3.8 [-2.6;12.6] bpm), RR (+6 [-1.5;26] cycles/min) and rSO_2 (+1.1 [-0.5;3.9]%) and a decrease of FOE (-1.4 [-4;-0.2]%) were observed when the light level increase more than 50 lux above the background light level (all $p < 0.05$). Below 50 lux variation, only RR (-8.4 cycles per minute [-28;-0.4]) and FOE (-0.7% [-0.6;0.2]) decreased ($p < 0.05$). Characteristics of the population did not seem to interfere with the VPI's responses in contrast to the initial degree of illumination (the higher the ambient baseline light level, the higher the reactivity).

Conclusion VPI react to small variations of their environment's illumination suggesting that they are able to detect light levels changes in the range recommended by the American Association of Paediatrics. The ambient baseline illumination can alter their responses.

PO-0436 POSTNATAL DEVELOPMENT OF THE AUDITORY THALAMOCORTICAL CONNEXIONS

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Anatomical tracing in animal models has shown that the thalamus projects to regions in the temporal lobe around primary auditory cortex, and many regions anterior to this. During development, post-mortem studies in humans have shown that myelination in the temporal lobes follows a posterior-to-anterior progression. Our aim was to investigate auditory development, and specifically the thalamo-temporal white matter connexions, in infants during the first postnatal year. We hypothesised that the connectivity will strengthen from birth through the first year, particularly in anterior temporal areas.

We recruited 4 healthy controls (1 month, 3 months, 9 months and 11 months). We assessed white matter tracts using diffusion-weighted MRI with probabilistic tractography. A highly accelerated multiband EPI sequence (monopolar acquisition, acceleration factor=4, iPAT=0) with 128 non-collinear diffusion weighting directions was acquired (TR/TE=1980/71, voxel size $2 \times 2 \times 2$ mm^3, b=1500 s/mm^2).

We found an increment in the strength of connectivity from 1 to 11 months between the thalamus and cortex (thalamo-temporal 60% and temporo-thalamic 37%). Moreover, the pathway's fractional anisotropy increased by 26% and its mean diffusivity dropped by 90%. Furthermore, the pattern of development followed a posterior-to-anterior progression, with an extension of connections to more anterior temporal regions at 9–11 months.

In conclusion, thalamic connections to the temporal lobe were found to strengthen in the first postnatal year, around primary auditory cortex, and especially in anterior temporal regions. The enhanced anterior temporal connectivity may reflect the development of the posterior-to-anterior cortical processing stream that in adults processes complex sounds such as language.

PO-0437 DEVELOPMENT OF A NEONATE PIGLET MODEL TO UNDERSTAND BLOOD-BRAIN BARRIER PHYSIOLOGY IN EARLY PRETERM BABIES

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Introduction The instant developmental switch of nutritional and oxygen supply from the umbilical cord to the lungs and the intestinal canal are necessary and dramatic changes for the offspring in order to adapt to life outside the uterus. This period is also characterised by exposure and colonisation by live bacteria, an assumed important step towards physiological programming of the newborn. The perinatal period is associated with establishment of a functional blood-brain barrier (BBB), essential for the brain development and protection from adverse systemic influences, which in rodents, has been suggested to be regulated by intestinal microbiome. To investigate whether the pig could be used as a model for preterm infant brain maturation, we studied the BBB in preterm and term newborn piglets.

Methods The integrity of the BBB was evaluated in caesarean-delivered preterm (90% gestation) and term-born neonate pigs immediately after birth (n = 10). The expression of main tight junctions proteins (TJPs) controlling the BBB, and the glucose transporter-1 (Glut-1) in the hippocampus and striatum were determined by western blot technique.

Results Alterations of TJPs expression in brain tissue were observed in hippocampus and striatum of preterm piglets compared to full-term controls. In addition, Glut-1 expression in the brain endothelial cells exhibited changes in a region-specific manner.

Conclusion This pilot study demonstrate altered expression patterns of TJPs and Glut-1 in hippocampus and striatum of preterm piglets compared to full term piglets which support that the BBB impairment observed in rodents may also extend to the BBB in preterm piglets.

PO-0438 THE ROLE OF PERMEABILITY FACTORS OF BLOOD-BRAIN BARRIER IN THE GENESIS OF RECURRENT PAROXYSMAL DISORDERS IN NEWBORNS WITH CONSEQUENCES OF CEREBRAL HYPOXIC-ISCHAEMIC INJURY OF CNS

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Aims The levels of matrix metalloproteinase-3 and soluble fraction of intercellular adhesion molecule-1 were investigated in blood serum.

Methods The prospective clinical and laboratory investigation of 60 newborns was made for the purpose of studying mechanisms of formation of paroxysmal states in newborns with cerebral hypoxia – ischemia. They formed two groups: group 1–40 children with paroxysmal disorders, group 2–20 healthy children.

The investigation was made on days 6–7 and 25–28. Paroxysmal disorders were represented by generalised tonic-clonic seizures, isolated focal seizures, focal seizures with secondary generalisation, myoclonias.

Results It was detected that in case of the recurrent character of paroxysmal states in the examined children an increase and deteriorative intensification is noted in peripheral blood in the dynamics of observation of matrix metalloproteinase-3, while the level of intercellular adhesion molecule remained equally heightened during the whole period of observation as compared with the control group.

Conclusions Thus, it is established that an increase in the level of matrix metalloproteinase-3 as an early marker of the cerebral structure injury forming blood-brain barrier under the conditions of cerebral hypoxic-ischaemic injury of CNS takes place in the onset of paroxysmal disorders in newborns of the examined groups.

PO-0439 EVALUATION OF THE CEREBRAL BLOOD FLOW IN CHILDREN WITH PERINATAL CNS DAMAGE BORN BY WOMEN WITH DIABETES MELLITUS ACCORDING TO DATA OF TRANSCRANIAL DOPPLER SCANNING

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Background The leading position in the structure of high perinatal morbidity of children born by women with diabetes mellitus (DM) is taken by the perinatal damage of CNS. It is known that in pathogenesis of hypoxic-ischaemic damages of CNS in newborns the dominant role is assigned to vascular disorders.

Aim To study of indices of the cerebral hemodynamics in such children.

Methods 105 full-term children born by women with DM were examined: mothers of 55 children had DM of type 1, mothers of 50 children had gestational DM (GDM). The control group was comprised of 17 healthy children born by women with physiological pregnancy and delivery. The cerebral blood flow was evaluated by means of Doppler scanning of medial cerebral and anterior cerebral arteries, deep veins of Rozenthal circle (vein of Galen and basal veins of brain) using ultrasonographs. The children were examined and observed in dynamics during one year (in the early neonatal period in 1, 3, 6, 9 and 12 months of life).

Results The perinatal CNS damage was diagnosed in all children both born by women with DM of type 1 and with GDM. In the majority of children neurological symptoms remained by the end of the first year of life despite of the provided treatment. The analysis of dynamics of the cerebral blood flow indices in medial cerebral and anterior cerebral arteries circulation showed the stable increase of resistance index during the whole period of observation as compared with the control values in the observed children ($p < 0.02$). Doppler scanning of deep intracranial collectors during the first year of life in children born by women with DM of type 1 and with GDM showed the persistent increase in relation to the control of outflow intensity in the vein of Galen ($p < 0.001$) and basal veins of Rozenthal ($p < 0.0001$).

Conclusions All children both born by women with diabetes mellitus of type 1 and with gestational diabetes mellitus have prolonged retained symptoms of the cerebral arteriovenous dysfunction, and it shall be considered with the purpose of optimisation of the pathogenetic therapy in such children.

PO-0440 VITAMIN D INCREASES IMMUNE RESPONSES IN NEONATAL ENCEPHALOPATHY *IN VITRO*

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Background Infection and inflammation can be antecedents of Neonatal Encephalopathy (NE) and increase the risk of neurological sequelae. Vitamin D is a potent immunomodulator and may alter the systemic inflammatory repose in NE.

Aim To investigate the *in vitro* effect of $1,25(OH)_2D_3$ on whole blood intracellular neutrophil production of ROI in NE patients at 72–96 h of age.

Methods Infants with NE were recruited and their demographics details, grade of NE, MRI results, outcome and placental histology were recorded. Whole blood was taken between 72 -96 h of age and analysed using flow cytometry for Toll-like Receptor (TLR)4, CD11b and reactive oxygen intermediates (ROI) in both monocytes and neutrophils in the presence of Lipopolysaccharide (LPS) and/or $1,25(OH)_2D_3$.

Results Five neonates with NE were recruited and all received therapeutic hypothermia (TH). At 72–96 h of age following TH there was enhanced production of monocyte and neutrophil ROI in the presence of LPS and this was augmented by $1,25(OH)_2D_3$ pretreatment*in vitro*. Similar effects were seen on TLR4 and CD11b production in both neutrophils and monocytes.

Conclusion $1,25(OH)_2D_3$ increases the productionof ROI in neutrophils and which may not be beneficial in NE in which an augmented systemic inflammation is underway.

PO-0441 OXYGEN REDUCTION INITIATIVE THAT DECREASED INCIDENCE AND SEVERITY OF RETINOPATHY OF PREMATURITY RESULTS IN FAVOURABLE NEUROPSYCHOLOGICAL OUTCOMES AT AGE THREE

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Background and aims High oxygen exposure has adverse long-term medical consequences in premature infants. We hypothesised that a quality improvement initiative decreasing oxygen saturation limits in NICU-admitted infants would affect neuropsychological outcomes at age 3.

Methods We studied 83 NICU-admitted participants born at 23–27 weeks; n = 37 (b.2009–2010) with targeted supplemental oxygen rates of 83–93% until 32 weeks, 85–95% until 35 weeks, and >95% after 35 weeks (O_2 Reduced); 8% laser eye surgery; 65% ROP compared with n = 46 (b.2007–2008) with higher target rates (89–100%; O_2 Higher); 28% laser eye surgery; 83% ROP. Group mortality rates (<10%) did not differ significantly, $\chi^2(n = 83, df=1)= 0.16$, $p = 0.900$. ANCOVAs and regressions were conducted for 19 neuropsychological outcomes.

Results O_2 Reduced performed significantly better than O_2 Higher in visual attention, controlling GA ($p = 0.042$; $d=.47$);