OUTCOMES FOLLOWING CHANGES TO DELIVERY ROOM (DR) PRACTICES IN PRETERM INFANTS <29 WEEKS

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Background: Based on the neonatal intensive care unit's outcomes from ePREM72 CPI group and NSW NICUS reporting, we identified following aims to improve clinical care for preterm infants <29 weeks 1. To improve senior medical staff (Neonatologist &/ Neonatal Fellow) presence at birth and 2. Use of colorimetric CO2 detector for early identification of upper airway obstruction during non-invasive respiratory support.

Methods: Plan-Do-Study-Act (PDSA) methodology was used throughout this CPI project. All inborn births < 29 weeks at Westmead Hospital 18 months before and after the implementation of changes were included. The CPI group performed staff education sessions on the changes to resuscitation practice, use of end tidal carbon dioxide detector with non-invasive respiratory support for early recognition of airway obstruction, instituting appropriate trouble shooting for non-response to positive pressure ventilation, early commencement of heated humidified gases and senior medical staff presence to oversee resuscitation.

Results: Statistically significant improvement in senior medical staff presence (56% to 76%, P = 0.005), overall reduction in DR intubation rates (73 to 54%, P = 0.0114), reduction in DR intubation rates for ≥ 26 wks (66% to 43%, P = 0.0117) were observed. A clinically important, but statistically non-significant improvement in proportion of infants with normocarbia on admission blood gas (56% to 67%) and reduction in proportion of infants with hypocarbia (23% to 18%) was observed.

Conclusions: Following implementation of changes to delivery room practices, we have demonstrated that using end tidal colorimetric CO2 detector is associated with reduction in need for DR intubation as well as a trend towards reduction in hypocarbia upon admission.

INVESTIGATING THE LONG-TERM BEHAVIOURAL AND NEUROCHEMICAL IMPACT OF IN-UTERO METHADONE EXPOSURE

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Background: Methadone is the most common Opioid Replacement Therapy in pregnancy. Methadone transverses the placenta, exposing the fetus at a critical period of neurodevelopment. Clinical studies indicate in-utero opioid exposure adversely affects neurocognitive parameters, particularly adolescent academic performance. Here we describe the neurobehavioural impact of in-utero methadone exposure on adolescent offspring in a newly developed, clinically relevant rodent model.

THE INFLUENCE OF TIME OF DIAGNOSIS ON NEURODEVELOPMENTAL OUTCOMES OF COMPLICATED MONOCHORIONIC PREGNANCIES

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Background: There is a paucity of data regarding the relationship between time of diagnosis of monochorionic twins with complications and the neurodevelopmental outcomes of these twins.

Methods: A prospective cohort study was conducted, comparing the neurodevelopmental outcomes of pre and post 28 week diagnosis of monochorionic complications. The study analysed the data of monochorionic twin pregnancies diagnosed at Liverpool Hospital, from 2009 until 2018. Outcomes were compared using independent samples t-tests, Chi-square analysis and the Fisher’s Exact Test.

Results: Significant differences in motor and language outcomes were observed between the pre and post 28 week groups: of 44.74% and 21.40% respectively. Categorical analysis revealed significance for motor outcomes between the pre and post 28 week groups (P = 0.016), and language outcomes in the numerical group (P = 0.009). Both results had higher neurodevelopmental means for the post 28 week group.

Conclusions: The post 28 week group was shown to perform better neurodevelopmentally than the pre 28 week group in language and motor outcomes. This confirms the justification of regular monitoring of monochorionic pregnancies.

scintigraphy (HIDA) in predicting BA among term and preterm neonates.

Methods: Retrospective cohort study of neonates born and investigated for cholestasis at 2 co-located neonatal and children facilities from January 2013 to December 2017.

Results: 139 neonates with cholestasis were identified. BA and intestinal-failure associated liver-disease (IFALD) was the most prevalent cause of NC in term (18%) and preterm (66%) cohorts, respectively. Incidence of BA was higher in term (1:6) than preterm (1:50) cohorts. (OR 10.29; P = 0.0024). Higher birth weight, acholic stool, absent or abnormal gallbladder on ultrasound was associated with BA while gestational age ≤32 weeks, total parenteral nutrition ≥14 days, and low albumin were associated with non-BA. In predicting BA, non-draining HIDA demonstrated a lower specificity (73% vs 90%) and lower PPV (25% vs 78%) in preterm compared to term neonates.

Conclusions: Etiologies of cholestasis among preterm neonates differ from those in term neonates and NC in preterm neonates may not warrant extensive evaluations for exclusion for BA. Pre-existing diagnostic approach to NC should be modified for preterm cohort, taking into account of the prevalence for each etiology, potential predictors and cost-efficiency.
Methods: Female adult Sprague-Dawley rats were treated with vehicle (0.2% saccharin) or methadone (30 mg/kg/day) two weeks prior to conception, throughout gestation and lactation. Adolescent offspring (postnatal days 35-45) underwent behavioural assessments, including open-field testing (OFT), novel object recognition (NOR) and rewarded T-maze alternation tasks. Furthermore, hippocampal BDNF protein levels were quantified.

Results: Methadone-exposed offspring exhibited altered patterns of exploratory behaviour, despite showing no difference of total locomotor activity in the OFT. Furthermore, methadone-exposed offspring displayed recognition memory deficits in the NOR task, in addition to learning deficits during T-maze tasks, exhibiting an increased percentage of incorrect entries during the training period and increased number of training sessions to acquire the task. In addition, methadone-exposed offspring exhibited reduced hippocampal BDNF expression.

Conclusions: These findings suggest that prenatal methadone exposure produces detrimental effects on cognitive processes in adolescent offspring, similar to clinical findings. These behavioural findings are associated with reduced BDNF levels, which is critical for neurocognitive function. The present findings are an essential first step to understanding the neurobiological alterations underpinning in-utero methadone exposure and this model provides a platform to assess potential alternative approaches for improved maternal and/or neonatal care.

OMEGA 3 LCPUFA SUPPLEMENTATION IN PREGNANCY AND THE INCIDENCE OF PRETERM BIRTH: A RCT

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Background: Maternal supplementation with ω-3 long chain polyunsaturated fatty acids (LCPUFAs) extends the length of pregnancy. We investigated whether an ω-3 LCPUFA supplementation strategy reduced the incidence of early preterm birth (<34 weeks EPTB), without increasing interventions for post-term pregnancies.

Methods: Women with singleton or multiple pregnancies were randomised to receive either fish oil capsules (900mg ω-3 LCPUFA/day) or vegetable oil capsules (with trace ω-3 LCPUFA) from <20 weeks. Supplementation ceased at 34 weeks or delivery, whichever occurred first, as a strategy to reduce post-term pregnancies. EPTB was the primary outcome; pregnancy and neonatal outcomes were also assessed.

Results: 5544 women were randomised. The incidence of EPTB between ω-3 LCPUFA supplemented women (61/2734, 2.25%) and controls (55/2752, 1.98%) did not differ (adjusted relative risk, ARR, 1.13, 95% CI 0.79-1.63; P = 0.50). There were no differences in interventions for post-term pregnancies, and no differences in pregnancy or neonatal outcomes except for an increased incidence of infants born very large for gestational age in ω-3 LCPUFA supplemented women compared with controls (ARR 1.30; 95% CI 1.02-1.65; P = 0.04). There were some interactions between ω-3 LCPUFA supplementation and multiplicity suggesting that supplementation does not benefit women with multiple pregnancies; in this regard supplementation was associated with a reduction in preterm birth in singleton pregnancies (ARR 0.81; 95% CI 0.67-0.99; P=0.04).

Conclusions: Supplementation with ω-3 LCPUFA in pregnancy from <20 until 34 weeks did not decrease EPTB, though did not increase interventions for post-term pregnancies. Benefits of ω-3 LCPUFA supplementation may be limited to singleton pregnancies.

Australian New Zealand Clinical Trials Registry (ANZCTR) number: ACTRN12613001142729

TARGETING THE NEUROVASCULAR UNIT WITHIN THE BRAIN OF PRETERM GROWTH RESTRICTED LAMBS TO REDUCE NEUROPATHOLOGY

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Background: Fetal growth restriction (FGR) is associated with neurological deficits. The neurovascular unit (NVU) plays a critical role in brain injury within the FGR brain. Umbilical cord blood (UCB) therapy has been shown to have anti-inflammatory and anti-apoptotic effects in perinatal brain injury, but its effects on the NVU are unknown.

Methods: Twin bearing pregnant ewes underwent surgery at 88d gestation (term, 147d) to induce FGR in one fetus. At 127d gestation, FGR and control (AGA) lambs were delivered, intubated and ventilated. Carotid flow probes, and cerebral oxygenation sensors were applied. UCB (25 million cells/kg) were given at 1h. Lambs were euthanized at 24h and effects of UCB on the NVU were assessed. UCB (25 million cells/kg) were given at 1h. Lambs were euthanized at 24h and effects of UCB on the NVU were assessed.

Results: FGR lambs (FGR (n=6), FGR+UCB (n=6) weighed significantly less than AGA lambs (AGA (n=6), AGA+UCB (n=6)), and FGR lambs demonstrated brain sparing. UCB increased cerebral blood flow (P<0.0001) and cerebral tissue oxygenation index (P=0.01) in FGR+UCB vs FGR. UCB administration decreased microglia activation (Iba-1), pro-inflammatory cytokines (IL-6, TNF-α); improved endothelial cell proliferation (Glut-1), and attachment of astrocyte foot processes to basal lamina (GFAP-Laminin). UCB stabilised pericytes (Desmin) on blood vessels and decreased BBB permeability (Albumin).

Conclusions: UCB therapy has significant effects on the NVU in the brain of preterm FGR offspring, leading to improved BBB stability and cerebral perfusion. This is the first study to evaluate the effects of UCB therapy on the NVU in perinatal brain injury and may inform targeted therapy for infants at high risk of cerebral palsy.