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IMPROVING ACCURACY OF CROWN-HEEL LENGTH MEASUREMENT WHILE AVOIDING DISCOMFORT ON THE NEONATE

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Background: Accuracy of neonatal length measurement may be influenced by the reluctance of the measurer to forcefully extend both lower limbs against the normal flexor posture. On the other hand, during the first days after birth the measured length may increase because of the gradual decrease of the intrauterine state of flexion. **Objective:** To assess potential differences in discomfort during length measurement with one or both lower limbs extended and any variation in measured length within the first two days after birth.

Methods: Seventy healthy full-term neonates born at Hospital Dona Estefânia were systematically sampled. Crown-heel length was measured using a 1 mm precision neonatometer, at circa 8 hours and 32 hours after birth, with one and both lower limbs completely extended. The Neonatal Facial Coding System was used to assess discomfort during measurements. Data were analyzed by parametric and nonparametric tests as appropriate.

Results: Discomfort scores are significantly higher during length measurement than at baseline, whatever the measurement method. Whenever length measurements are performed, discomfort scores are significantly higher extending two rather than one lower limb ($p<0.006$). Measured length is higher with one lower limb extended, the difference decreases in time: at circa 32 hours of age 0.19 cm (95% CI: 0.1–0.3; $p=0.000$). No significant differences on length were found between measurements at circa 8 or 32 hours after birth, for both one and two lower limbs extended. The best correlation between measurements with one or two extended lower limbs was observed at circa 32 hours after birth ($r=0.98$).

Conclusion: The best balance between the comfort of the neonate and the accuracy of crown-heel length measurement is achieved at circa 32 hours after birth extending one lower limb.

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OSMOLALITY OF PRETERM FORMULAS SUPPLEMENTED WITH GLUCOSE POLYMERS AND MEDIUM CHAIN TRIGLYCERIDES

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Background: Addition of energy supplements to preterm formulas is a possible strategy to increase the enteral energy intake, without exceeding the protein intake or the potential renal solute load, in infants submitted to fluid restriction, such as in bronchopulmonary dysplasia. This manipulation of standard formulas may lead to undesirable increase in osmolality of feedings, 400 mOsm/kg is the maximum recommended limit. **Objective:** To measure the osmolality of some commercialized preterm formulas supplemented with glucose polymers (PG) and medium chain triglycerides (MCT).

Methods: Osmolality was measured by freezing point depression. Powdered formulas Aptamil Prematil® (Numico-Milupa), Enfamil Premature® (Mead-Johnson), Nenatal® (Numico-Nutricia) Nutribén Bajo Peso® (Alter) and Pre Nan® (Nestlé), at concentrations of 14g/100ml (14%) and 16g/100ml (16%), and the liquid formula Humana 0® (Humana) were analyzed. All powdered formulas at both mentioned concentrations, and the liquid formula, were supplemented with 10% (low supplementation – LS) and 20% (high supplementation – HS) of calories, respectively, as PG (Moducal®, Mead-Johnson) and MCT (MCT oil Module®, SHS) maintaining a 1:1 glucose:lipid calorie ratio. The approximate mean caloric densities (Kcal/100ml) of the preparations were 71 (14%), 78 (14% LS), 85 (14% HS), 81 (16%), 89 (16% LS) and 98 (16% HS); 75 (liquid), 83 (liquid LS) and 90 (liquid HS). The amount of macronutrients provided by each preparation and the respective potential renal solute load were registered. The Inter-analysis and intra-analysis coefficients of variation of the measurements were always $<3.9\%$.

Results: The osmolality (mOsm/Kg) of powdered formulas (mean $\pm$SD) at 14g/100mL (273.8 $\pm$16.5) increased 4% with LS (283.8 $\pm$18.1) and 6% with HS (290.6 $\pm$18.8); the osmolality of powdered formulas at 16g/100mL (312.8 $\pm$17.7) increased 5% with LS (329.8 $\pm$19.3) and 10% with HS (343.6 $\pm$18.6); the osmolality of the liquid formula (331.3 $\pm$3.5) increased 4% with LS (347.0 $\pm$2.2) and 6 with HS (352.8 $\pm$2.7). The potential renal solute load of all the preparations was always <24.2 mOsm/100 kcal.

Conclusion: Almost all supplemented and non supplemented formulas provide the minimum energy necessary for infants submitted to fluid restriction, without associated excessive protein intake or excessive potential renal solute load. No formula analysed, including supplemented formulas, exceeded the maximum recommended osmolality for neonatal feedings.

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BDNF OVER-EXPRESSION AND CATECHOLAMINERGIC CONTROL OF BREATHING

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Adaptations to the environmental modifications are important for the survival of the adult and the newborn who may be exposed to physiopathological hypoxemia. Neonate who died from Sudden Infant Death Syndrome present long-term hypoxemic symptoms. The response to the hypoxic stimulus needs the intervention of structures that all together act as a reflex called chemoreflex loop. Carotid bodies (main sensors of the arterial PaO2 decrease), the Nucleus Tractus Solitarius and the sympatho-adrenal pathway, constitute the cardio-respiratory sympathetic chemoreflex loop. Each step of the reflex needs a large number of neurotransmitters. However, all structures are catecholaminergic. Furthermore, in the newborn, the activity of peripheral arterial chemoreceptors is very low or even non-existent at birth, then the next few days this activity starts to emerge and allows the young animal to start to respond to hypoxic exposure. In the carotid body, two factors play an important role in its maturation, dopamine, an inhibitory modulator that down-regulates the maturation, and BDNF that up-regulates the maturation. BDNF is involved in the targeting and the survival of the chemoafferent nerves of the carotid body in the brainstem. We have built a transgenic mouse over-expressing BDNF in the neural stem cell during the development in order to study the catecholamine/BDNF relation in the maturation process. Here we present the effect of a BDNF over-expression on the catecholaminergic activity in the carotid bodies, petrosal ganglion and sympathetic ganglion. We also analyzed the breathing pattern in the newborn mice in normoxic and hypoxic conditions. The transgenic mice are over-expressing BDNF under the Nestin second intron (enhancing sequence). The second intron directs the nestin expression exclusively in the nervous system. The in vivo tyrosine hydroxylase (the rate limiting enzyme in catecholamine synthesis) activity was determined in the different structures by measuring by chromatography the endogenous DOPA accumulation after blockade of DOPA decarboxylase with NSD 1015.The ventilatory response to hypoxia in awake and unrestrained mice was studied by barosensible plethysmography. The catecholaminergic activity was preferentially increased in the carotid body of the transgenic mice. When challenging the transgenic animals to hypoxia, we observed a different time course in the response. The transgenics reach quicker the plateau. Our preliminary results confirm a tight relation between BDNF expression and the level of maturation in the control of breathing.

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INTESTINAL COLONISATION OF VERY LOW BIRTH WEIGHT INFANTS WITH ANTIBIOTIC RESISTANT GRAM NEGATIVE BACILLI

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Background: Microbial antibiotic resistance is a major public health concern. The bowel flora of babies nursed on neonatal units is characterised by few normal commensals and may be dominated by hospital acquired organisms. In a pilot study 18 of 22 (82%) babies who had been on NICU >7days were found to have stools colonised with antibiotic resistant Gram negative bacilli (rGNB) at times between discharge and 357days. The objective of the present study was to investigate the rate and clinical associates of colonisation with rGNB in a population of VLBW babies on a second neonatal unit.

Methods: Babies <1500g birthweight and >23 weeks gestational age were recruited into a study involving randomisation to receive Bifidobacterium breve BBG for 28 days starting within 48h of birth. Quantitative microbiological analysis was performed on the available stool closest to 28 days.

Results: 40 babies (median BWt 864g, IQR 777 - 1144g; GA 26.8w, IQR 25.4 - 29.0w) were recruited of whom 38 survived to 28d. Stools were available for 34 of these. 25(74%) were colonised with GNB resistant to one class of antibiotics and 10(29%) had multi-resistant strains. Of 16 babies born to women on antibiotics at the time of delivery, 8 (50%) were colonised with multi-resistant GNB (mrGNB) compared with only 2 of 18(11%) babies whose mothers were not on antibiotics, $p=0.023$. There were no other statistically significant associations between gestational age, birthweight, birhweight Z-score, sex, prolonged membrane rupture, ante-natal steroids, caesarian section, whether or not the baby was colonised with Bifidebacterium breve BBG at 28d, the number of days the baby was on antibiotics or whether the baby had received a cephalosporin in the first 28d and colonisation with either rGNB or mrGNB.

Conclusion: Rates of intestinal colonisation of babies cared for on our NICUs with antibiotic resistant Gram negative bacilli appear to be high and posibly to be associated with the use of maternal antibiotics around the time of birth. Further work is needed to explore this phenomenon further and to determine whether the graduates of our nurseries represent a public health risk in the community following discharge.

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DOSAGE OF AMINO ACIDS AND PROTEIN IN EXTREMELY LOW BIRTH WEIGHT (ELBW) INFANTS DURING THE FIRST WEEK

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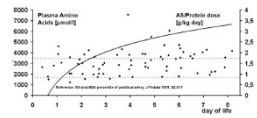
Background: Daily protein doses of 3.6 – 3.8 g/kg bodyweight have been recommended for ELBW infants (Tsang 1993). For the first day of life 3.0 g/kg amino acids have been recommended (Thureen and co-workers Pediatr Res 2003; 53:24–32). **Objective:** To examine the homoeostasis of plasma amino acids in ELBW infants during the first week of life when enteral nutrition was started with complimentary parenteral feeding aiming at a dose of 3.8 g/kg amino acids/protein.

Methods: In a pilot study of 12 ELBW infants plasma amino acid concentrations were measured longitudinally by ion exchange column chromatography. The infants were admitted consecutively and not selected. Data is given as minimum-median-maximum.



Results: 72 Samples were taken from 12 ELBW infants (birth weight 410 – 660-980g; gestational age 24–28-31 weeks) on days 1–9. The total amino acid concentrations were above the reference range (95th percentile of the umbilical cord artery plama) in 33 (46%) samples.

Conclusion: The standardized feeding advancement protocol aiming at a dose of 3.8 g amino acids/protein per kg birth weight caused hyperaminoacidaemia in nearly half of the samples. The protein requirement seems to be lower than 3.8 g/kg during the first week of life in ELBW infants.

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ENDOTHELIN-1 LEVELS IN PRETERM NEWBORNS WITH RESPIRATORY DISTRESS SYNDROME

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Background: Exact role of endothelin-1 (ET-1) in respiratory distress syndrome (RDS) of the preterm infant is still unclear. Therefore, the aim was to assess umbilical cord and plasma levels of ET-1 in preterm newborns with RDS in comparison to control preterm infants.

Methods: We studied preterm newborn infants with gestational age less than 34 weeks, and birthweight less than 2000 grams . Immediately after birth, a segment of umbilical cord was doubly clamped, and a blood sample was collected. Peripheral venous blood was collected 12 to 48 hours after birth. Both samples were utilized to determine ET-1 levels by enzyme-immunoassay . Patients were divided in RDS and control groups. Sample size was estimated to be 17 patients in each group for detection of a difference in ET-1 levels between both groups of 40%, with a significance of 5%, and a power of 80%. The study protocol was approved by the Ethics Committee at Hospital de Clinicas de Porto Alegre and informed consent was obtained from patients' parents or guardians.There were no venous punctures performed only for the study. This study had no funding sources of commercial nature and/or consulting or holding of significant equity in a company that could be affected by the results.

Results: Forty newborn infants were included , 18 in RDS and 22 in control groups. Seventeen RDS patients received surfactant therapy in the first hours of life, twelve required mechanical ventilation, three developed bronchoplumonary displasia (BPD), and five died. None of the control infants received surfactant therapy, mechanical ventilation, developed BPD or died.

	RDS	Control	p value
N	18	22	
Gestational Age (weeks) mean±SD	29±2.3	31±1.6	<0.005
Birthweight (grams) mean±SD	1065±220	1580±276	<0.001
Umbilical cord ET-1(pg/ml) median (p25–p75)	11.4(7.1–17.3)	10.9(7.4–14.2)	0.9
12–48 hours ET-1 (pg/ml) median (p25–p75)	3.5(2.7–4.9)	1.7(1.4–2.2)	<0.001
Mean sample timing (hours)± SD	30.3±9.4	29.7±10	0.85

Conclusions: 1.Umbilical cord ET-1 levels in both groups were similar.2.ET-1 levels in blood samples collected 12 to 48 hours after birth were significantly higher in RDS infants in comparison to control group.3.Those findings suggest ET-1 is involved in the pathogenesis of pulmonary vascular reactivity in preterm infants with RDS.