

228 NEONATAL SKIN SURFACE PCO₂ OBTAINED WITH UNHEATED AND HEATED TRANSCUTANEOUS ELECTRODES. Luis A. Cabal, Antonio Gomez, Hernan Cruz, Elvezia Fumagalli, Joan E. Hodgman, Univ. of So. Calif. Sch. of Med. LAC/USC Med. Center, Dept. of Peds., Los Angeles, California

The inherent characteristics of nonheated (NH) and heated (H) transcutaneous PCO₂ electrodes (PtcCO₂) favor their application in different clinical conditions. Knowledge of factors affecting NHPtcCO₂ values and of changes induced by HPtcCO₂ electrodes is necessary for their clinical use. 24 infants, BW 840 to 4240 gms., GA 24 to 43 wks were studied at ages 8 to 110 hrs. HPtcCO₂ at 43°C and 44°C were monitored and related to PaCO₂. Good correlations with PaCO₂ have been demonstrated for NHPtcCO₂ (r.8), 43°C (r.86) and 44°C (r.91) HPtcCO₂, (all with p<.001). The factors analyzed were: maturity, body weight, sex, postnatal age, and the use of radiant warmers (RW) and incubators (I). Results for NHPtcCO₂: preterm infants had PtcCO₂ higher by 4mmHg than term infants (p<.005). Infants weighing 2500 grms. (n=17) had mean PtcCO₂ levels 4mmHg higher than larger infants (n=8) (p<.01). Postnatal age did not affect PtcCO₂. There were no differences between genders. Mean PtcCO₂ were higher in infants in I than RW (p<.01). In asymptomatic premature with PDA, values from right infraclavicular area were lower (p<.001) than those from other areas of the body studied. All differences found for NHPtcCO₂ disappeared when 43°C and 44°C HPtcCO₂ electrodes were used. Correlations of HPtcCO₂ with PaCO₂ are better (r=.95). The values obtained with NH electrodes represent CO₂ release from undisturbed skin of neonates; the recent availability of electrodes had made their retrieval possible.

229 CARBONIC ANHYDRASE ACTIVITY IN ADULT AND FETAL RABBIT RED BLOOD CELLS AND LUNG TISSUE: A SIMPLE ASSAY AND CORRELATION DURING DEVELOPMENT WITH LUNG LIQUID AND AMNIOTIC FLUID ANION COMPOSITION. J.A. Canfield (Sponsor Louis Gluck) U. of Calif. San Diego, Dept. Pediatrics, La Jolla, Calif.

An assay for carbonic anhydrase activity was developed which measures pH deflection rate from the hydration of dissolved CO₂. Enzymatic activity is expressed as ml CO₂ hydration catalysis per minute per mg Hgb or lung tissue protein at 22°C.

5 to 10 fetuses per litter at 25 through 31 days gestation were studied. Over this range amniotic fluid chloride fell from 114 ±2 to 110 ±1 meq/L and bicarbonate fell from 19 ±2 to 11 ±4 meq/L. The lung liquid chloride ranged from 144 ±10 to 158 ±2, peaking at 27 days gestation. Bicarbonate ranged from 0.3 ±0.2 to 6.1 ±1, lowest at 27 days.

Fetal RBC carbonic anhydrase activity correlated significantly with gestational age, rising from 14.9 ±3 to 34.9 ±4 ml CO₂ hydration per minute/mg Hgb at 22°C. Adult red cell activity was 84.6 ±13. Lung tissue carbonic anhydrase activity was independent of that in RBC, and ranged from 3.2 ±1.3 to 6.1 ±1.8 ml CO₂/min per mg lung protein, and directly correlated with fetal lung liquid Cl⁻/HCO₃⁻ ratios, peaking at 27 days gestation then decreasing to the levels found at term and in the adult rabbit lung.

230 GENETIC INFLUENCES ON PANCREAS TRANSPLANTATION. Salvador Castells, Sam Smith, Jim Walberg, Anthony Cerami, Dept. of Pediatrics, SUNY, Downstate Med.

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The susceptibility of mice to develop experimental diabetes vary among different inbred strains. 6J mice are more resistant to develop diabetes than KsJ mice due to the ability of their islet cells to undergo hypertrophy. These differences may manifest also during transplantation. Twelve 6J mice were made diabetic with streptozotocin given at 1 mg per gm body weight and 12 KsJ mice with 0.5 mg per gm. A week later islet cells from 6 week old normal 6J and KsJ mice were transplanted into the kidney capsule of the diabetic mice. Pancreas tissue from two normal 6J and two KsJ mice were minced with scissors into fragments about 0.5 to 1 mm in Hank's solution and immediately transferred into the renal capsule of the 6J and KsJ diabetic host respectively. The course of the diabetes was followed by determination of plasma glucose. The pre transplantation mean ±SD glucose was 524±119 in 6J and 529±76 mg/per 100 ml in KsJ, and the post transplantation was 263±134 in 6J and 426±135 mg/per 100 ml in KsJ. Islets containing beta cells were stained with aldehyde fuchsin and found to be present in higher numbers in 6J than in KsJ mice. The significantly higher recovery from hyperglycemia in 6J mice than in KsJ mice suggests a genetic influence in the ability of transplanted islet cells to reverse diabetes.

231 AUDITORY BRAINSTEM RESPONSE AUDIOMETRY (ABR) IN NEONATES. Michael J. Cevette and Jack L. Dolcourt (sponsored by Lowell Glasgow), Speech-Language-Hearing Center,

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Delayed intervention in hearing-impaired infants may diminish ultimate speech and language development. A program for identifying hearing-impairment using ABR was initiated for neonates in the intensive care nursery. Hearing in 81 neonates whose birth weights ranged from 800 to 3980 grams was tested using ABR. Infants were tested when they achieved a post-conceptual age of 34 weeks or within 1 week of birth. Normal binaural hearing (30 dB HL) was found in 64/81 (79%). Hearing abnormalities were detected in 17/81 (21%) and included: mild monaural hearing loss (no response at 30 dB) in 5 neonates (6.2%); mild binaural hearing loss in 5 other neonates (6.2%); moderate binaural hearing loss (no response at 40 dB) in 3 neonates (3.7%); moderately-severe or severe binaural hearing loss (no response at 60 dB) in 4 neonates (4.9%). The expected incidence of hearing loss in a normal nursery population is <1%. The high incidence of hearing loss observed in this study suggests that formal ABR be performed in the ICN prior to discharge.

232 EFFECTS OF GASTRIC NUTRITIONAL SUPPLEMENTATION ON UMBILICAL UPTAKE OF NUTRIENTS AND BLOOD FLOW IN THE FETAL LAMB. Valerie E. Charlton, Brenda L. Reis, University of California, Department of Pediatrics, San Francisco.

Intrauterine, nutritional supplements might benefit the growth retarded fetus. We studied the effects of gastric infusions of nutrients on umbilical uptake (Umb U) of amino N, glucose, lactate and O₂ and on lower body blood flow, using 14 fetal lambs (126-138 days gestation, 6-17 days post surgery) with indwelling femoral arterial (FA), umbilical venous (UV), cranial mesenteric venous (CMV) and gastric catheters. Seven received 2 hr infusions of 8.5% L-amino acids (Travasol, 10-25mg/kg/min) and seven received 20% glucose (14-38mg/kg/min). Umb U and intestinal uptakes were calculated from measurements of FA, UV and CMV whole blood nutrient concentrations and microsphere blood flow measurements, made twice before the infusions and 2-3 times in the 2nd hr. During amino acid infusions, the intestine absorbed amino N, at a mean rate equal to 45% of Umb U of amino N. Umb U of nutrients did not change but O₂ uptake decreased (p<.05). When glucose was infused, the intestine absorbed glucose, at a mean rate equal to 42% of Umb U of glucose. Umb U of amino N, lactate and O₂ did not change. Umb U of glucose decreased, in inverse proportion to the rise in FA glucose concentration (p<.01). During the infusions, umbilical blood flow decreased (mean of 12%, p<.005), while intestinal blood flow increased (mean of 41%, p<.05). Conclusions: Fetal gastric supplementation with amino N is possible. Glucose supplementation is limited by the decrease in Umb U of glucose which occurs, when fetal glucose concentration rises.

233 ENERGY COST OF GROWTH OF VERY LOW BIRTHWEIGHT (VLBW) INFANTS. Philippe Chessex, Brian L. Reichman, Gaston J.E. Verellen, Guy Putet, John M. Smith, Tibor Heim,

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Energy cost of growth of VLBW (<1300 g at birth) formula fed (SMA 20/24) infants (mean ± SE weight at study: 1390 ± 50g; age at study: 24 ± 2d) has been determined. By combining open circuit indirect calorimetry in a thermoneutral environment, dietary balances and anthropometric measurements in 34 studies on 19 growing infants, we measured: 1) metabolizable energy intake (MEI) or the absorbed proportion (85%) of energy intake (150 ± 3 Kcal/kg.d); 2) metabolic energy expenditure (MR); 3) postprandial thermic effect or specific dynamic action (SDA), assumed to be the metabolic cost of tissue synthesis; 4) weight gain (Wt.G.). The energy of nutrients stored as new tissue (E.stored) is determined as: MEI - MR - SDA. The energy cost of growth (E.growth) = E.stored + cost of tissue synthesis (SDA). Results (mean ± SE Kcal/kg.d):

MEI	MR	E.stored	SDA	E.growth	Wt.G(g/kg.d)
127 ± 3	65 ± 1	62 ± 3	7 ± 1	69 ± 3	17 ± 1

Conclusions: In these VLBW infants 46% of the energy intake is utilized for growth (comprising 41% energy stored and 5% energy for new tissue synthesis). The energy cost of deposition of 1g of new tissue (E.growth/Wt.G) is 4.1 ± 2 Kcal and thus to attain the equivalent of intrauterine Wt.G. (~15g/Kg.d) a metabolizable calorie intake of 50-60 Kcal/kg.d in excess of maintenance energy requirements must be provided.