1636 MEAN AIRWAY PRESSURE-SIGNIFICANCE DURING ASSISTED VENTILATION. Thomas A. Ciszek, Houchang D. Modanlou, and Donald Owings, Miller Children's Hosp, Long Beach, CA.

Mean airway pressure (MAP) directly relates to oxygenation in neonates with respiratory distress syndrome (RDS). Variations in the Positive End Expiratory Pressure (PEEP) with concomitant changes of the Duration of Positive Pressure (DPP) while MAP, Peak Inspiratory Pressure, flow, FiO₂ and rate remained constant, were investigated in 9 neonates with RDS during the 1st and 2nd day of life. After stabilization on baseline ventilator settings, PEEP was increased by an average of 60% and the DPP was decreased (about 0.3 sec) in order to maintain baseline MAP. Following a return to baseline, a second experimental condition consisted of decreasing PEEP by 60%, increasing DPP accordingly to maintain constant MAP. Arterial BP, heart rate, paO₂, paCO₂, pH and arterial/Alveolar pO₂ ratios (a/APO₂) were measured before, during, between and after the experimental conditions. Analysis of the data revealed no significant changes in BP, paO₂, a/APO₂, heart rate during baseline or experimental conditions. PaCO₂ decreased significantly when PEEP was decreased and DPP increased, both on Day 1 (37.2 ± 6.6 vs 41.4 ± 6.4 Torr; p<.025) and Day 2 (42.1 ± 7.4 vs 46.8 ± 5.6 Torr; p<.05). The changes in pH were inversely related to paCO₂ changes. Air leaks occurred in 2 neonates who had MAP greater than 12cmH₂O which was statistically higher than MAP in neonates without air leaks (12.9 vs 8.8cmH₂O; p<.025). This study confirms the importance of MAP in determining oxygenation in neonates with RDS. However, ventilation was significantly affected by variation in PEEP and DPP despite a constant MAP.

1637 VENTILATION, RESPIRATORY CENTER OUTPUT AND CONTRIBUTION OF THE RIB CAGE AND ABDOMINAL COMPONENTS TO VENTILATION DURING CO₂ REBREATHING IN CHILDREN WITH CYSTIC FIBROSIS (CF). Allan L. Coates, Katharine J. Desmond, Joseph Milic-Emili, Pierre H. Beaudry (spon. by Harvey Guyda) The McGill Univ.-Montreal Children's Hospital Research Institute and The Meakins Christie Laboratories, Montreal, Que. Canada.

We investigated the respiratory response of CF patients to CO₂ under hyperoxic conditions. Using a standard CO₂ Read rebreath technique, we studied 14 CF patients with mild to severe degrees of airway obstruction. We evaluated their response to CO₂ in terms of their ventilation (VE), mean inspiratory flow rates (VT/Ti) and their occlusion pressures (P_L). In order to understand the contributions of the rib cage and abdominal components to ventilation (V_{rc} and V_{ab}) we assessed the volume change in each compartment by the use of magnetometers. We found that, when normalized for the height of the child, the slope of VE vs end tidal CO₂ (PETCO₂), as well as the slope of VT/Ti vs PETCO₂, correlated significantly with the forced expiratory flow between 25 and 75% of vital capacity (FEF₂₅₋₇₅) (r_s.78, p<.001 and r_s.74, p<.01 respectively). The values for P_L were within the normal range and did not correlate with the FEF₂₅₋₇₅. The contribution of V_{rc} to the increases in VT with increasing VE was double that of V_{ab}. The increasing V_{rc} correlated with the increasing VT (r_s.88, p<.001). This predominance of V_{rc} is similar to that seen in normals. In conclusion, we have shown that tests involving a mechanical response to CO₂ correlate with the FEF₂₅₋₇₅. There is no evidence of abnormalities in the control of breathing.

1638 PERIPHERAL AIRWAYS DISEASE (PAD) IN ASYMPTOMATIC CHILDREN WITH ASTHMA. Dan M. Cooper, Anthony L. Mansell, Charles H. Feldman and Robert B. Mellins, College of Physicians & Surgeons, Columbia Univ., Dept. of Peds., New York.

We have frequently detected maldistribution of ventilation in asymptomatic children with asthma by using the single breath oxygen test (SBO₂). We hypothesized that this results from chronic PAD since there is histologic evidence that PAD occurs in asthma. To test this we compared the slope of the alveolar plateau of the SBO₂ to two indices of PAD: 1) density dependence (DD) of maximum expiratory flow (ΔV_{max50VC} after breathing He-O₂) and 2) ratio of residual volume to total lung capacity (RV/TLC) by plethysmograph in 28 asthmatic children aged 6-18 years. We found that all children with slopes in our normal range had normal DD and there was no correlation between slope and flow obstruction (MMEF range 42-121% predicted). The children with steep slopes (>2SD) had markedly reduced DD and elevated RV/TLC confirming the presence of PAD; MMEF was very low and they were hospitalized five times more frequently during the previous year (H/YR). Table shows means±SD. *p<.01 by unpaired t test.

	N	ΔV _{max50VC} (%)	MMEF(%pred)	RV/TLC(%)	H/YR
NORMAL SLOPE	18	47±20	74±22	25±8	0.3±0.4
STEEP SLOPE	10	14±5*	33±19*	38±6*	1.7±1.6*

Although tests of expiratory flow obstruction are traditionally used to assess chronicity of asthma, we show that a test of distribution, the SBO₂, will help identify a more severe group with PAD. This group may have a worse long-term prognosis and therefore requires a different therapeutic approach.

1639 NEUTROPHIL FUNCTION IN THE IMMOTILE CILIA SYNDROME (ICS) Chris W. Corkey, Joe O. Minta, Peter Turner and Douglas Biggar, Research Institute, Hospital for Sick Children and the University of Toronto, Canada.

Patients with ICS have an increased frequency of sinusitis and respiratory infections. Abnormal ciliary movement likely contributes to these frequent infections. In addition, abnormal neutrophil function has been reported previously for some patients with ICS. We have studied neutrophil function in ICS patients with the three known ultrastructural abnormalities of cilia. Fifteen patients were examined. Their mean age was 12.1 years. Neutrophil functions included; migration assessed under agarose and in Boyden chambers, phagocytosis and killing of *Staphylococcus aureus* 502A, and the metabolic activity of cells at rest and during phagocytosis as assessed by hexose monophosphate pathway activity, hydrogen peroxide production, tetrazolium dye reduction and lysosomal degranulation. When tested, the patients were not on antibiotics. They were afebrile and free of acute infection. Normal neutrophils were studied in parallel. Five patients with respiratory infections but normal cilia were also examined. No ICS patient demonstrated a significant abnormality in neutrophil migration. Phagocytosis and killing of *S. aureus* was normal. There was no evidence of abnormal metabolism by cells at rest or during phagocytosis. Two patients with normal cilia had a transient decrease in neutrophil migration during a respiratory infection. Our findings suggest that abnormal neutrophil function does not predispose, in a major way, to respiratory infection in patients with ICS.

1640 REDUCED EFFECTIVE PULMONARY BLOOD FLOW MAY LEAD TO INCREASED MORBIDITY IN INFANTS RESIDING AT HIGH ALTITUDE. Ernest K. Cotton, University of Colorado School of Medicine and the Webb-Waring Lung Institute, Denver, Colorado.

Infants living at 3100 meters altitude have a higher morbidity to mild respiratory illness than do infants living below 1300 meters. The morbidity is expressed as exaggerated hypoxemia. This exaggeration could be explained by a reduction of blood flow to alveoli (effective pulmonary blood flow, Q_{eff}). Previous studies on infants born at sea level and 1300 meters show that Q_{eff} is low during the first 25 hours of age (100→150 ml/min/kg) but rises over the next 72 hours to normal levels (175→200 ml/min/kg). We measured the Q_{eff} by a noninvasive rebreathing technique on 15 infants born at 3100 meters. Q_{eff} was measured at 2, 8, 18, 34, 60 and 80 hours of age. We found that the Q_{eff} in these infants was similar for the first 18 hours in babies born below 1300 meters, (95→122 ml/min/kg), but after 18 hours dropped to lower levels, 107 ml/min/kg, by 80 hours of age. We conclude that Q_{eff} is reduced after 20 hours of age in infants living at 3100 meters. Therefore, the added reduction of PO₂ to the alveoli caused by a respiratory infection could result in significant hypoxemia for those infants.

1641 GAS TRAPPING IN CYSTIC FIBROSIS (CF). Gerd J. Cropp, Orison Velasquez-Garcia, State Univ. of New York, Children's Hospital, Dept. of Pediatrics, Buffalo.

Airway obstruction in CF causes significant hyperinflation. The hyperinflated lung does not communicate normally with central airways, and the poorly communicating regions contain trapped gas (TG). We measured this volume from the difference between the functional residual capacities (FRC) as determined by body plethysmography (BP) and helium dilution, and expressed it as the fraction of BP-FRC (TG/FRC). TG/FRC was then related to the severity of lung dysfunction, as assessed by a pulmonary function score (PFS). The PFS (0 = normal; 18 = extreme) was derived from the vital capacity, forced expired volume in the first second, maximum mid-expiratory flow rate, residual volume and specific airway conductance. To date 9 normals, 10 mild scoliosis patients without a history of lung disease and 23 CF patients have been studied.

	PFS ± SE	TG/FRC ± SE	Diff. from Normal
Normals	1.2 ± 0.36	5.1 ± 1.85	----
Scoliosis	0.3 ± 0.21	5.3 ± 2.04	n.s.
CF	7.8 ± 1.05	32.4 ± 4.16	p < 0.001

There was a significant linear correlation (r = 0.87) between PFS (y) and TG/FRC (x): y = 3.45 x + 3.96. We conclude that as lung functions deteriorated in CF patients, the TG/FRC increased. The TG regions probably contribute importantly to ventilation/perfusion inequalities in CF and are a major cause of arterial hypoxemia in these patients.