●1876 MOMENT ANALYSIS OF MULTIBREATH NITROGEN WASHOUT (MBNW) AS A TEST OF LUNG FUNCTION IN YOUNG CHILDREN. M. Wall M. Misley, and D. Dickerson (spon. by S. LaFranchi), Dept. of Pediatrics, Oregon Health Sciences Univ., Portland, OR.

Moment analysis (MA) of MBNW could in theory be a good method of quantifying ventilation inhomogeneity in young children since it requires only quiet breathing of oxygen for <2 minutes and the results are independent of breathing pattern or lung volume. We have developed the software required for on-line MA of MBNW and have performed duplicate studies on 36 healthy children (H) and 10 with cystic fibrosis (CF) ages 3-6 years. Outcome variables included FRC, moments 0,1,2 and moment ratios M_1/M_0 and M_2/M_0. In H there were no sex related differences in FRC or moment ratios while absolute moments tended to be higher in boys ($p<.05, M_0$). Intrasubject coefficient of variation (CV%) was <10% for all variables. Intersubject CV% for M_1/M_0=8%, M_2/M_0=13%, and FRC=18%. A modified Shwachman (S) score was used to quantify lung involvement in CF with a score of 75 being the best possible. The CF group varied from no lung involvement to severe disease, S score 30-75. Mean FRC was no different in CF vs H while mean M_1/M_0 and M_2/M_0 were both higher in CF, 2.59 vs 2.32 and 13.04 vs 9.31, $p<.001$. 7 of 10 CF had moment ratios >95th percentile of H. The 3 with values in the normal range had higher S scores than the 7 with abnormal values, mean 65 vs 47, $p<.001$. Moment ratios in CF showed a good correlation with S scores; for instance $M_1/M_0=3.35-.01 \cdot S$ score $r=.67$, $p<.01$. We conclude that MA of MBNW has promise as a test of lung function in young children since the method is non-invasive, low in variability, and appears to have the sensitivity required to detect mild ventilation inhomogeneity.

†1877 INFLUENCE OF BREATHING PATTERN, SLEEP STATES, AND MATURATION ON FUNCTIONAL RESIDUAL CAPACITY (FRC) IN NEWBORN INFANTS. H. WALTI, M.F. RADVANYI, M. CHAUSSAIN G. MORIETTE, J.P. RELIER, sponsored by A. MINKOWSKI, INSERM U.29 Hôpital Port Royal, Paris, France.

During behavioural active sleep (AS) as compared to quiet sleep (QS), a 30.% decrease in lung volume has been reported in term newborns. This study was designed to determine whether such changes in lung volume are related to changes in sleep states or to changes in breathing pattern. The role of maturation was also assessed. We used the helium dilution method to measure FRC. Neurophysiologic criteria were used to identify sleep states. Movements of chest and abdomen were monitored. Results ($\bar{x} \pm SD$; FRC= mean of 2 or more measurements) in 26 healthy newborn infants are as follows :

Groups	n	GA(wk)	BW(KG)	FRC (ml/cm) AS	FRC (ml/cm) QS
I (29-33 wks)	6	30.8 ± 1.3	1.51 ± 0.13	1.24 ± 0.31	1.38 ± 0.47
II(34-36 wks)	10	34.8 ± 0.7	2.17 ± 0.59	1.42 ± 0.24	1.50 ± 0.17
III(37-38wks)	10	36.5 ± 0.9	2.41 ± 0.82	1.69 ± 0.37	1.57 ± 0.31

FRC increased with GA ($p<0.02$). Using ANOVA, we could not show any significant difference between FRC during AS vs QS. In 7 out of these 26 newborn infants, FRC happened to be measured when breathing showed two completely opposite patterns : OUT of phase and IN-phase breathing. FRC "OUT" (1.38 ± 0.25 ml/cm) was lower than FRC "IN" (1.56 ± 0.25 ml/cm) ($p < 0.001$). Our results suggest that in the healthy newborn infant during sleep the observed changes in lung volume are related to changes in the breathing pattern and not to changes in sleep states per se. Lung volume increases steadily with maturation.

●1878 OXYGEN INCREASES GLUTATHIONE REDUCTASE AND GLUTATHIONE LEVELS IN DEVELOPING LUNG IN VIVO AND IN VITRO. Joseph B. Warshaw, Kotaro Saito, Charlie W. Wilson, III, Jeanne M. Snyder, and Russell A. Prough. The University of Texas Health Science Center at Dallas, Departments of Pediatrics, Cell Biology and Biochemistry, Dallas, Texas.

Total glutathione (GSH-GSSG) levels and glutathione reductase (GR) activity are rapidly responsive to changes in O_2 environment in developing rat lung in vivo and explants obtained from fetal and new born lung. GSH-GSSG levels decreased from 24 nmol/mg protein on day 18 of gestation to 10 nmol/mg protein at birth. GSH-GSSG then increased postnatally in air and O_2 exposed groups. GSH-GSSG of lungs of animals maintained in 100% O_2 were twice that of room air controls. All of the increase of lung GSH-GSSG could be accounted for by increased GSH. Glucose-6-phosphate dehydrogenase activity and γ-glutamyltranspeptidase, an enzyme of the glutathione cycle, were also increased significantly in lungs of O_2 exposed newborn rats.

GR activity in explants of 21 day fetal rat lung cultured in 95% O_2 was also two-fold greater than room air controls. GSH-GSSG were consistently greater in the O_2 exposed explants similar to what was observed in vivo. These data suggest that glutathione status of developing lung can undergo rapid changes in response to the oxygen environment and likely plays an important role in protection from oxidant injury. Supported by USPHS Grant HD 17785.

1879 EFFECTS OF NIFEDIPINE ON PULMONARY HYPERTENSION IN A CHILD. RE Weibley, JM Sherman (Spon by Lewis A Barness) Univ. of S. FL Dept. of Peds. Divs. of Critical Care and Pulmonary Medicine, Tampa, Florida.

Primary pulmonary hypertension (PPH), an uncommon disorder in adults and children, is characterized by elevated pulmonary arterial pressures (PAP), pulmonary vascular resistance (PVR), reduced cardiac index (CI) and widened $AVDO_2$. In adults, the calcium channel blocker nifedipine (N) lowers PVR and increases CI without significant changes in PAP. It's use in children has not previously been reported. A 9 y/o, 20 kg patient with a 9 month history of progressive dyspnea, diaphoresis and exercise intolerance was found to have PPH. We report the cardiovascular effects of 10 mg oral N.

Parameter	Normals	Pre-N	1 Hr Post-N
CI	3.5-5.51/min/M^2	2.7	5.0
$AVDO_2$	3.0-5.0 vol%	6.9	5.0
SAP	70-95 mmHg	77	78
PAP	10-20 mmHg	54	25
SVRI	800-1400 dyne.sec/cm^5/M^2	2252	1128
PVRI	70-230 dyne.sec/cm^5/M^2	1304	365
P/SAP	0.14-0.21	0.70	0.32
P/SVRI	0.08-0.16	0.58	0.32

N effectively improved both the flow and pressure-related parameters in this patient, with a greater effect on the pulmonary circulation than the systemic circulation. Based on these results, this patient has been treated with N 10 mg po every 4 hrs with dramatic relief of all symptoms over the subsequent 6 months. N therapy should be evaluated in other pediatric patients with PPH.

†1880 RAT AND HUMAN SURFACTANT ASSOCIATED APOPROTEINS Jeffrey A. Whitsett, William Hull, Mary A. Petro, and Mark Shapiro, Children's Hospital, University of Cincinnati, Ohio.

Apo-protein(s) have been demonstrated in surfactant material from mammalian species. We have used immunologic probes to detect and characterize proteins from alveolar wash from adult rat and from amniotic fluid (human) and lung lavage from adult humans. Antibodies were generated with both surfactants which recognize Mr 35-37,000 (Apo A) and Mr 28,000 (after sulphydryl reduction). Anti sera were species specific. Apoproteins were analyzed by (SDS-PAGE) and 2-D, isoelectric focusing (IEF-PAGE) followed by transblot to nitrocellulose and immunoperoxidase labelled with the species specific antibodies. Rat Apo A is acidic pI 4.4-4.8 with 6 immunoreactive species at 37,000 and 3 at 35,000. Antisera stained Type II cells, primarily labelling lamellar bodies. An ELISA assay was used to quantitate apoprotein in rat lung (18d gestation to adulthood). Apoproteins were first detected by 20d gestation, dramatically increasing at 21d gestation. Apoprotein (A) obtained from human samples also migrated with Mr 35-37,000, isoelectric point similar to the rat, pI 4.4-4.8. The more acidic species were more prominent in rat than in the human apoprotein at Mr 37,000. Charge heterogeneity of apo A's suggests that there is significant post-translational alteration of these molecules, likely related to glycosylation or other co-valent modification. Rat apoproteins are first expressed in late gestation in the rat. While structurally similar (pI and mol wt) there are major immunologic differences between human and rat surfactant apoproteins.

1881 CLINICAL FEATURES OF CYSTIC FIBROSIS (CF) PATIENTS WITH NORMAL LUNG VOLUMES AT AGE 16 YEARS. Madolin K. Witte, Robert C. Stern, Carl F. Doershuk. Case Western Reserve University, Rainbow Babies and Childrens Hospital, Pediatric Pulmonary Division, Cleveland.

We report 41 CF patients (18 female, 23 male) with normal lung volumes and excellent status at age 16. All had sweat chloride > 75 meq/Liter (mean 113±17 mEq/L). Median age at diagnosis was 16 months (range 2 days - 12 years), with 49% diagnosed by 6 months and 83% by 5 years. Gastrointestinal (GI) disease was present in 93% and pulmonary disease in 66% at diagnosis, with 11 (27%) having had pulmonary symptoms for more than one year prior to diagnosis. Pulmonary function parameters (mean ± S.D.) at age 16 include vital capacity 103±12% and forced expiratory volume in one second 107 ±23% predicted for height; residual volume/total lung capacity ratio 0.22 ±0.05. In the 25 patients for whom data are available, mean maximal midexpiratory flow rate was 56±17% predicted for height. Mean Shwachman-Kulczycki clinical score (maximum 75 points) at age 16 years was 67±5, with none showing a decline in score from 12 to 16 years. Mean radiograph score (maximum 25 points) was 19.4±2 at 16 years, with 78% having stable or improving findings between ages 12 and 16 years. Of the 30 patients followed at our center from diagnosis 19 (63%) attained a radiograph score of 22 or greater within the first year of treatment. By age 16, Pseudomonas aeruginosa had been repeatedly isolated from sputum of all but 9 patients (22%), with 25 having been colonized for more than 5 years and 16 for ten years or more. Neither long-standing GI and pulmonary disease nor early major pulmonary set-backs preclude an excellent teenage outcome.