1762 EFFECTS OF HIGH FREQUENCY JET VENTILATION ON PULMONARY AND HEMODYNAMIC PARAMETERS IN A RABBIT MODEL. J Nicks, S Donn, K Bandy, R Dechert and R Bartlett. Depts of Pediatric Respiratory Therapy, Pediatrics, and Surgery, University of Michigan Hospitals, Ann Arbor. (Spon. by GW Goldstein).

In order to assess the effects of high frequency jet ventilation (HFJV) on pulmonary and hemodynamic parameters, 10 anesthetized adult rabbits (1.8-2.2 kg) were studied while receiving HFJV and conventional mechanical ventilation (CMV). Each rabbit received two hours of one ventilatory mode, then two hours of the other. HFJV was delivered by a Sechrist 990 HFJ ventilator while CMV was delivered by a Sechrist IV-100 B infant ventilator. Prior to data collection ventilation in both modes was adjusted to maintain the P_aCO_2 between 35 and 45 Torr. CMV was accomplished using a peak inspiratory pressure of 12 cm H_2O and 4 cm H_2O end expiratory pressure. Ventilatory rates of 300 (six rabbits) and 600 (four rabbits) breaths per minute were used during HFJV. In both modes FiO_2 was 0.5 and flow rate was 10 L/min. Pulmonary gas exchange (A-a DO_2), venous saturation (SvO_2), mean airway pressure (MAP), heart rate (HR), mean arterial blood pressure (BP), and central venous pressure (CVP) were recorded every 30 minutes (Table). The results suggest no impedance to pulmonary gas exchange, a lower MAP, and improved hemodynamic stability with HFJV compared to CMV in the adult rabbit.

Table

	A-a DO_2	SvO_2	MAP	HR	BP	CVP
HFJV	123±29	84±5%	2.8±.7	129±14	71±16	12±9
CMV	122±35	76±19%	6.1±.6	135±12	48±11	5±7
p	NS	NS	.05	NS	.05	NS

†1763 DUPLICATION OF THE CHEST LAG IN REM SLEEP BY INSPIRATORY FLOW-RESISTIVE LOADING IN NREM SLEEP. Shahnaz Duara and Kimberley K. Bessard (Spon. by Allen Schwartz) University of Maryland School of Medicine, University of Maryland Hospital, Department of Pediatrics, Baltimore.

In REM sleep relaxation of the geniohyoid and genioglossus muscles have been shown, which will result in an increase in the intrinsic resistive load of the upper airway. To determine the role of this increase in load on paradoxical chest wall movement (CWM) noted in preterm infants during REM sleep, CWM in REM was compared to CWM in NREM and CWM in NREM with external inspiratory flow resistive loading in 5 preterm infants. Abdominal wall and CWM were measured by Hg strain-gauges, sleep state evaluation included EOG and EEG and a stable load (L) of 100 cm H_2O/L/sec by face-mask and one-way valve was used. Mean ± SEM BW was 1.42 ± 0.19 kg, GA was 31.8 ± 1.5 wks and post-natal age was 5.8 ± 1.53 wks. In NREM sleep, the respiratory rate was 66.6 ± 13.3 breaths/min, T_i was 0.46 secs ± 0.04 secs, T_i/T_{tot} was 0.50 ± 0.01 and there was a delay between abdomen and chest rise (A-C lag) of 0.21 ± 0.07 sec, which was 22.5 ± 6.4% of T_{tot} (% delay). In comparison to NREM, both REM and NREM + L produced significant prolongation of A-C lag and % delay. The A-C lag was 0.46 ± 0.11 sec in REM, $p<0.05$, and 0.33 ± 0.08 sec in NREM + L, $p<0.01$. The % delay was 40.7 ± 5.3 in REM, $p<0.05$, and 29.9 ± 6.5% in NREM + L, $p<0.01$. Only NREM + L increased T_i significantly to 0.63 ± 0.05 sec, $p<0.05$, and T_i/T_{tot} to 0.58 ± 0.01, $p<0.05$. These data indicate that raising the inspiratory flow resistive load of the upper respiratory system increases chest lag independent of other factors accompanying sleep state change.

1764 MEASUREMENT OF LUNG WATER(LW) AND CARDIAC OUTPUT (CO) IN THE NEONATAL LAMB. William D. Engle, Gary D. Hankins and Charles R. Rosenfeld, Southwestern Med. Sch., Dept. Peds. and Ob-Gyn, Dallas, Texas.

Excess LW appears to be a significant factor in some neonatal respiratory disorders, and improved methods for measurement of LW have both investigative and clinical importance. Use of a double-indicator (thermal, indocyanine dye) dilution technique with microprocessor technology (Edwards LW Computer) has been extensive in adult animals and humans; however, the large injection volume(V), 10ml, has precluded use in neonates. To determine adaptability of this technique to use in neonates, LW and CO were measured in 6 lambs between 3 days and 9.5 wks of age. Animals were studied daily for 5-6 days; studies consisted of 6 injections of each of 3 volumes (2,5, and 10ml). Mean coefficients of variation for LW for each V were 11.6 to 15.5%; those for CO were 6.5 to 13.4%. Correlations between V and log LW were -0.81 to -0.96 ($p<0.001$); between V and log CO they were -0.92 to -0.97 ($p<0.001$). Ratios(R) for the 10:5ml V and the 10:2ml V, respectively, were: LW=0.421±0.048 ($\bar{X}$±SD) and 0.115±0.024; CO=0.480±0.015 and 0.158±0.010. Gravimetric measurements (GM) of LW were 4.36 to 5.52ml/g dry wt and 16.2 to 19.1ml/kg body wt (N=3). Mean values for LW estimated using R from 10:5ml and 10:2ml differed from GM by 12.4 and 10.7%, respectively. CO was similar to previous reports, 230 to 535ml/kg·min. These data are suggestive that the double-indicator dilution technique can be modified for the use of a smaller V (2 or 5ml), and thus may have potential application in the neonate.

1765 PRETERM BABOONS WITH HYALINE MEMBRANE DISEASE (HMD) DEMONSTRATE SIGNIFICANT IMPROVEMENT IN OPENING AND PEAK PRESSURES BY THE THIRD DAY MB Escobedo, RL Boyd, C Cipriani, M Montes, T Kuehl, J Coalson, J Guerra, R deLemos (Spon. by YW Brans).Univ of TX Health Sci Ctr, Southwest Fd for Res and Educ, US Air Force, Wilford Hall Med Ctr, Depts of Ped, San Antonio & Lackland City

Ventilated preterm baboons (140±2da) with HMD show a significant reduction in opening and peak pressures on pressure volume curves on the third day (74±2 hr) compared to initial studies (3±1hr). Thirteen preterm baboons (140±2da) were delivered by Cesarean section, resuscitated, and ventilated with a conventional neonatal ventilator (Bear Cub) or one of 2 high-frequency ventilators. After ketamine and succinylcholine intravenously the intubated animals were tested in a constant volume plethysmograph with an esophageal balloon in place. The inspiratory limb of the pressure volume curves at 0.5 H_z were analyzed for the opening pressure, defined as the pressure at the point of departure from an isovolumetric transpulmonary pressure change. The peak transpulmonary pressure was defined as the highest pressure required to ventilate the animal.

	Day 0 (n=13)	Day 3 (n=10)	t-test
Opening P in cmH_2O (mean ±SD)	18.89±7.62	5.03±2.83	$P<0.01$
Peak P	29.39±9.53	19.20±3.10	$P<0.01$

Opening and peak pressures were significantly improved by the third day. Differences due to ventilator type were not apparent. Changes in opening and peak pressures may be a sensitive measure of improvement in HMD in preterm baboons.

1766 THE ROLE OF SELENIUM (SE) IN THE DEVELOPMENT OF BRONCHOPULMONARY DYSPLASIA (BPD). Horacio Falciglia, Margaret Ginn-Pease, Grace Falciglia, A. Harold Lubin, Donald Frank and William Chang. (Spon. by Reginald Tsang). Perinatal Center, Good Samaritan Hospital, Cincinnati, Ohio and Children's Hospital, Columbus, Ohio.

Plasma Se, erythrocyte Se and erythrocyte glutathione were measured in nineteen premature infants with severe Respiratory Distress Syndrome (RDS) in cord blood, at 3 days and 30 days of age. Plasma vitamin E (vitE) was also assessed for its role in peroxide degradation. Patients (pts) were evaluated for BPD and divided into 2 groups by this diagnosis. The 2 groups consisted of 8 pts with RDS alone and 11 pts with RDS and BPD. The demographic data profiles and the requirements for supplemental oxygen and mechanical ventilation during the first 3 days of life, were similar.

	Plasma Selenium (ug/l)		Plasma Vitamin E (μ)	
	-BPD	+BPD	-BPD	+BPD
Cord Blood	48 ± 15.4 (7)*	69 ± 49.0 (11)	4.4 ± 2.51 (7)	4.3 ± 2.21 (11)
3 Day	53 ± 29.9 (5)	57 ± 31.1 (10)	12.9 ± 5.40 (5)	5.9 ± 4.38 (10)
30 Day	47 ± 35.4 (8)	30 ± 12.5 (8)	20.6 ±11.81 (5)	12.3 ± 9.57 (9)
	Erythrocyte Selenium (ug/gHb)		Erythrocyte Glutathione (mg/gHb)	
Cord Blood	0.71 ± 0.306 (7)	0.52 ± 0.475 (11)	1.01 ± 0.655 (4)	1.22± 0.538 (11)
3 Day	0.92 ± 0.430 (5)	0.55 ± 0.262 (9)	1.30 ± 0.413 (4)	1.07± 0.491 (9)
30 Day +	0.70 ± 0.204 (8)	0.74 ± 0.406 (10)	1.16 ± 0.485 (8)	1.14± 0.639 (8)

+ Number of Samples * Significant at $P<0.05$ for t-test, log t-test

No difference was found in the levels of Se in plasma between the 2 groups. Erythrocyte Se and glutathione values were somewhat lower in the BPD group than in the RDS group at age 3 days. In infants with BPD the levels were higher in cord blood than at 3 days and at 30 days. Pts with BPD had significantly lower plasma vitE levels at age 3 days than pts with RDS alone. VitE levels in infants with BPD increased significantly over time but still remained lower than in infants with RDS at 30 days. Findings from this study shows a possible interaction between Se and vitE in the development of BPD. (Grants from Research Foundation of GSH, #12 and Children's Hospital, Columbus, Ohio #74-345).

1767 ANTENATAL DIAGNOSIS OF LUNG HYPOPLASIA. Jason C. Birnholz, and Elaine E. Farrell. (Spon. by Carl Hunt) Rush Medical College, Dept. of Radiology, Rush-Presbyterian - St. Lukes Medical Center, Chicago, Ill. and Northwestern Medical School. Dept. of Pediatrics, Evanston Hospital, Evanston, Illinois.

Evaluating the fetal lung is a component of the ultrasonic assessment of newborn viability. We have combined subjective ultrasonic visualization of the lung with quantitative parameters including the ratio of cross sectional areas of the heart and thorax, average rib spacing (midaxillary line), relative lung reflectivity, and the occurrence and pattern of diaphragmatic movement. We have been able to recognize pulmonary hypoplasia antenatally in 21 cases, 18 through 35 weeks gestational age (3-renal agenesis, 3-renal dysgenesis, prune belly S., 3 nonimmune and 1 immune hydrops, 2-prolonged ROM, triploidy, trisomy 13, chromototrophic dwarves). We have also seen lesser degrees of hypoplasia with spondylocostal dysplasia, massive pulmonary replacement with adenomatoid malformation, 2 sequestrations, and one case of increased lung volume with decreased reflectivity later found to have laryngeal atresia.

Lung hypoplasia can be diagnosed antenatally. Detection of severe hypoplasia contraindicates decompressive intra-fetal procedures or operative delivery.