†1852 ABNORMAL LUNG COLLAGEN RATIOS IN VENTILATED HUMAN NEONATES.

Craig Shoemaker, Jerold Last, Karen Reiser, Boyd Goetzman. Department of Pediatrics and California Primate Research Center, University of California, Davis

We assessed lung collagen in human infants at risk for chronic lung disease (CLD) because Type I collagen is increased in adult RDS, and idiopathic or experimental pulmonary fibrosis. We determined collagen Types I and III in the lungs from 15 human infants who died while receiving mechanical ventilation, and in 3 stillborn infants. We analyzed lung tissue by CNBr digestion, column chromatography and index polypeptide separation by polyacrylamide gel electrophoresis. To decrease the influence of measurement error of Type I collagen, we calculated ratios of Type I to III collagen. We then compared infants with clinical and/or pathological CLD to those without CLD using pooled variance techniques and one tailed t-tests.

	MEAN BW(GMS±SD)	MEAN RATIO I/III±SD	VENT. DAYS(RANGE)
NO CLD-9	2004±953	1.60±0.14	0-6
CLD-9	1232±863	3.08±1.67 (p<.01)	5-147

We observed a significant increase in Type I/III collagen with CLD. No general relationship between total ventilator time and collagen I/III ratios existed, but bacterial pneumonia may have been contributory to rapidly developing CLD. All infants with pathologic CLD had increased Type I collagen. Two infants dying early with very high I/III ratios had evidence of prenatal brain damage, suggesting that some increased collagen synthesis may be the result of prenatal lung injury.

●1853 FACTORS AFFECTING THE EFFICACY OF AMINOPHYLLINE FOR APNEA OF PREMATURITY.

Maureen Sims, Savitri Rambhatla, Gloria Yau, Luis Cabal, Paul Y.K. Wu. USC Sch. of Med., LAC-USC Med. Ctr., Dept of Ped., Los Angeles.

Aminophylline (A) is often used to treat apnea of prematurity. To determine response times, optimal length of therapy, effectiveness of A in relation to gestational age (GA) and postnatal age (PA), we conducted a randomized, blinded controlled study in 45 premature infants with recurrent apnea. Infants were divided into 2 groups. Group I (n=23, BW=1395±359g, GA=31±2wks., PA=3.2±2d) received A (mean serum level 8.9mcg/ml) and Group II (n=22, BW=1306±336g, GA=30±2wks., PA=2.3±1.8d). Results: In infants not requiring assisted ventilation (AV): Group I (18/22) had less apnea 24 hours after institution of therapy ($p<.025$) and apnea ended in 67% of the infants by the 7th day. In 3 infants, apnea was minimally reduced (<25%) during the first 7 d and persisted for 4 weeks despite continued therapy. Group II (14/23) did not show a significant decrease in apnea until 72 hours and only 35% were free of apnea by 7th day. Apnea persisted in 3 infants for 4 weeks. In infants requiring AV: similar numbers in both groups developed respiratory failure. Twelve of the 13 infants needing AV were $\leq$ 31 GA and had $\geq$ 4 apneic episodes during the first 24 hours PA. Conclusion: A does not prevent respiratory failure and is not effective in infants $\leq$ 31 wks. GA with early onset repetitive apnea. Twenty percent of premature infants are refractory to A and can be identified by evaluating their response within the first 7 days of therapy. Prolonged treatment with A is not an effective therapy for apnea of prematurity.

†1854 EFFECT OF THEOPHYLLINE ON VENTILATORY PARAMETERS DURING INSPIRATORY RESISTIVE LOADING.

E.M. Sivieri, M.R. Wolfson, V.K. Bhutani, W.W. Fox, T.H. Shaffer and S. Abbasi, Univ. Pa. Sch. Med., Pennsylvania Hosp, Dept. Pediatr, Temple University Sch. Med., Dept. Physiology, Philadelphia. Pa.

Previous studies suggest that preterm infants lack the ventilatory reserve necessary to compensate for an additional inspiratory load. Theophylline (TH) is often prescribed for apnea of prematurity and bronchopulmonary dysplasia. To evaluate the effect of TH on ventilatory parameters, seven preterm infants ($\bar{x}$ ± SEM: 29.6 ± .92 weeks gestation; 1.24 ± .14 kg birthweight) were challenged with an externally applied inspiratory resistive load (300 cm H_2O/L/sec). The infants were studied at a mean age of 46.3 ± 9.3 days, weight of 1.75 ± .19 kg, and TH level of 7.6 ± .9 mg%. Tidal volume (V_T), frequency (f), minute ventilation (MV) inspiratory/total breath time (T_i/T_{tot}) and work of breathing (WOB) were assessed during spontaneous unloaded (UL) and loaded (L) breathing. Heart rate, transcutaneous O_2 and CO_2 tensions were continuously monitored. Mean ± SEM values are shown below:

	V_T ml/kg	MV ml/M/kg	f b/M	T_i/T_{tot}	WOB kg cm/kg
UL	8.8 ± 1.3	551 ± 82	64 ± 4	.46 ± .02	.028 ± .001
L	10.3 ± 1.5	566 ± 19	56 ± 5	.49 ± .03	.053 ± .018

These data indicate that theophylline therapy is associated with an increased ventilatory effort in response to an inspiratory resistive challenge. This study suggests that theophylline therapy improves the ventilatory reserve capacity of preterm infants and enhances their ability to maintain ventilation during periods of obstructed breathing.

1855 MECHANISM OF GAS EXCHANGE ABNORMALITIES DURING GROUP B STREPTOCOCCAL SEPSIS IN PIGLETS.

G.K. Sorensen, G.J. Redding, and W.E. Truog, Dept. of Pediatrics, Univ. of Washington, Seattle, WA. Spon. by D.E. Woodrum.

Hypoxemia is common in newborns with Group B Streptococcal (GBS) sepsis, yet the mechanism of abnormal gas exchange in this disease is unknown. We studied ventilation-perfusion matching (V_A/Q) and shunt fraction using the multiple inert gas elimination in 7 newborn piglets receiving live GBS. Measurements were made in anesthetized animals ventilated with room air before, during, and after a 30 min intravenous infusion of $2x10^9$ colony forming units/kg of GBS. Shunt fraction was measured by sulfur hexafluoride retention and standard deviation of distribution of pulmonary blood flow (sdPBF) was used as an index of V_A/Q heterogeneity. Changes are depicted below; *denotes $p<.05$.

	Base-line	During Infusion	Post Infusion 20 min	1 hr	2 hrs
PaO_2(mmHg)	99±6	54±9*	75±24	85±14	87±12
CO(ml/min/kg)	264±37	153±27*	218±33*	215±52	183±45*
PvO_2(mmHg)	37±2	26±8*	23±7	33±4	30±4
Ppa(mmHg)	15±3	39±4*	21±9	18±5	22±5
Shunt(%)	1.9±1.4	6.4±4.9	7.2±12.3	2.1±1.6	1.7±1.0
sdPBF(Units)	.44±.30	1.0±.19*	.61±.29	.69±.25	.78±.21

PaO_2, CO and PvO_2 fell while Ppa and sdPBF increased significantly during GBS infusion. Shunt increased to >6% in only 2 of the animals. We conclude that arterial hypoxemia during GBS sepsis in newborn piglets results primarily from diminished cardiac output with resultant fall in mixed venous oxygen tension along with an increase in V_A/Q heterogeneity within the lungs.

1856 NON-INVASIVE MONITORING OF BLOOD GAS PARAMETERS IN PEDIATRIC AND YOUNG ADULT PATIENTS WITH CHRONIC PULMONARY DISEASE.

Marilyn E. Alley and Alexander Spock, Duke University Medical Center, Department of Pediatrics, Durham, N. C.

Evaluation of respiratory function in patients with chronic lung disease is usually performed by clinical evaluation, chest x-ray, pulmonary function tests and blood gas analyses. Non-invasive techniques have been utilized for inpatient but not outpatient monitoring of blood gas parameters in chronic lung disease. In this study we prospectively compared the results of non-invasive techniques, as measured by an IL capnograph for PECO2 and a BIOX oximeter for oxygen saturation (SoxO2), with arterialized blood gas values (SaO2, PaO2, PaCO2) in 45 consecutive patients in the age range of 6 to 31 years. The following results were obtained:

	PaO2	SaO2	SoxO2	PaCO2	PECO2
range	48-109	84-98	88-98	30-53	30-52
mean	68.0	91.8	92.4	38.8	39.0
	SoxO2 v SaO2*		PaO2 v SoxO2*		PECO2 v PaCO2*
correlation coefficient	0.764*		0.716*		0.943*

*significance < 0.001

From these data, the SaO2 and PaO2 are both predictable from the SoxO2, as is the PaCO2 from the PECO2. This indicates that the capnograph and oximeter can be used effectively to non-invasively monitor blood gas parameters in patients with chronic pulmonary disease, particularly in pediatric patients. Any abnormalities or variation can be confirmed by blood gas levels.

1857 HEMODYNAMIC EFFECTS OF HIGH FREQUENCY JET VENTILATION (HFJV) AND CONVENTIONAL VENTILATION (CV).

W.A. Spohn, S.E. Courtney, D.S. Miles, R.W. Gotshall, W.J. Yike, S.M. Ciarlariello. Wright State University, The Children's Medical Center, Depts. of Pediatrics and Physiology, Dayton, Ohio (Spon. by M. Kogut).

The purpose of this study was to evaluate the effects on the cardiovascular system of HFJV compared to CV. Seven dogs ($\bar{x}$=19.6 Kg) were monitored for 1 hour on CV, followed by 1 hour of HFJV, and were then returned to CV. Dogs were anaesthetized with pentobarbital and the skeletal musculature blocked with pavulon. Thermal dilution cardiac output, (CO), systemic and pulmonary arterial pressure were obtained at 20 min intervals. A Harvard volume respirator was set at V_T of 200 and rate of 24. A Healthdyne model 300 high frequency ventilator was set at a mean rate of 120 and a drive pressure of 30, to achieve a similar peak pressure ($\bar{x}$=13) and PEEP ($\bar{x}$=2.5) as on CV. Blood gases remained within the normal range with both forms of ventilation.

($\bar{x}$ values)	CO (l/min)	SV (ml)	MAP (mm Hg)	SVR (mm Hg/l/min)	PVR (mm Hg/l/min)
CV_1	3.6	19	132	42	4.1
HFJV	2.8	16	138	54	5.5
CV_2	2.4	13	142	67	6.4

There was a significant ($p<0.01$), progressive fall in CO, due to a fall in stroke volume (SV). Mean arterial pressure (MAP) was maintained as both systemic vascular resistance (SVR) and pulmonary vascular resistance (PVR) significantly increased ($p<0.01$). These results most likely reflect compensation to a temporal fall in CO and not differences between CV and HFJV.