1849 TOTAL RESPIRATORY SYSTEM COMPLIANCE IN INFANTS WITH CYSTIC FIBROSIS. R. Tepper, P. Hiatt and H. Eigen. (Spon. by J. Lemons) Indiana Univ. School of Medicine, Dept. of Pediatrics, Indianapolis.

In the only study to measure dynamic pulmonary compliance (C) in cystic fibrosis infants (CFI) it was low. Esophageal catheters were used, but these are invasive and may be inaccurate due to chest wall distortion. We evaluated weighted spirometry technique for measuring total respiratory system compliance (Crs) in CFI. We studied during sleep 5 CFI and 9 normal controls (NC) mean ages 6.1 and 6.2 months. We tested respiratory rate (RR), functional residual capacity (FRC) by helium dilution, mixing index (MI), specific total respiratory system compliance, $Crs = Crs/FRC$, and size corrected flows ($V_{max}FRC/FRC$) by rapid chest compression.

	$V_{max}FRC$ (FRC/s)	RR (BPM)	FRC (ml/kg)	M.I. (%)	Crs (l/cmH ₂ O)
NC (9)	1.1±.4	30±4	21±5	.52±.10	.05±.01
CF (5)	.9±.4	41±7	26±1	.37±.14	.03±.00
P value	>.5	<.01	<.10	<.05	<.01

CFI had lower Crs than NC but similar flows. In the absence of small airways dysfunction, the low Crs and higher RR in CFI could result from increased elastic recoil since Crs should be quasi static after equilibration of pressure to all lung units. However, the low MI and high FRC in CFI indicates small airway dysfunction. Thus, the low Crs may be secondary to frequency dependence. We conclude that Crs is low in CFI and represents a non-invasive method for assessing early pulmonary dysfunction. Supported by NIH Grant #HL01322-01, HL990-03 and ALA Fellowship.

1850 FLOW LIMITATION IN INFANTS WITH CYSTIC FIBROSIS DURING A PULMONARY EXACERBATION. R. Tepper, P. Hiatt, H. Eigen, D. Wyszomierski and J. Meyers. (Spon. by J. Lemons) Indiana Univ. School of Medicine, Indianapolis.

We evaluated nine CF infants, mean age 18 months (5.5-28), during pulmonary exacerbation (PE) and again at follow-up (FU), mean 3.4 months (1-6) post PE. During sleep, we measured 1) respiratory rate (RR), 2) function residual capacity (FRC) by helium dilution, 3) mixing index (MI) and 4) size corrected flows at FRC ($V_{max}FRC/FRC$). Clinical scores (CS), 0-25 (healthy), were based upon cough, cyanosis retractions, breath sounds, and clubbing. During PE, 5 infants required hospitalization (H) and 4 were outpatients (OP). The H group had significantly lower ($P<.03$) $V_{max}FRC/FRC$ (.19 vs .80). Five of 5 H and none of OP infants reached flow limitation during tidal breathing, but RR, FRC/kg, and MI between groups were not significantly different (NSD). Between PE and FU, paired t-test for combined H and O groups demonstrated increase in $V_{max}FRC/FRC$, +.49 ($P<.01$), and decrease in FRC/kg, -.3 ($P<.04$), but NSD in RR or MI.

There was a significant linear regression between CS and $V_{max}FRC/FRC$ ($r=.80$). We conclude that pulmonary function changes during PE in CF infants can effectively be assessed from partial expiratory flow volume curves and that flow limitation during tidal breathing is associated with severe lung disease.

1851 GROWTH FACTOR RELEASE BY LUNG CELLS IN VITRO IN RESPONSE TO HYPEROXIA. M. Tzaki, P. Byrne, K. Tanswell. Dept. of Paediatrics, University of Western Ontario, London, Canada.

Pulmonary oxygen toxicity is associated with both fibroblast and pneumocyte hyperplasia. The factors which initiate these cellular responses are unknown. We have used a lung cell culture model to test the hypothesis that hyperoxic lung cells release autocrine or paracrine growth factors. Mixed lung cell cultures from adult rats, when made hyperoxic with 50% O₂, released factors into their culture medium after 48-72 h of exposure which enhanced growth of normoxic mixed lung cell cultures ($p<.01$). This activity is increased by dialysis and partially destroyed by heating the medium at 55°C. The same conditioned medium enhanced growth of lung fibroblasts alone ($p<.01$). Conditioned medium from hyperoxic fibroblasts enhanced growth of normoxic fibroblasts ($p<.001$). This fibroblast-derived factor is heat stable, non-dialysable and can be extracted in chloroform:methanol. Lung fibroblasts also release factors into their culture medium after 5-6 days in 50% O₂ which increase ³H-thymidine uptake by isolated type II pneumocytes ($p<.05$).

This preliminary data supports the hypothesis that autocrine (fibroblast-fibroblast) and paracrine (fibroblast-pneumocyte) growth factors play a role in the pathological changes of pulmonary oxygen toxicity.

1852 PROSTAGLANDIN (PG) SYNTHESIS INHIBITORS AND LUNG DEVELOPMENT IN FETAL SHEEP. LD Wallen, RI Clyman, CH Lee, DT Murai, FE Mauray, JA Kitterman, Univ of California, Cardiovascular Res Inst, Dept Ped, San Francisco.

Before delivery in fetal sheep tracheal fluid production decreases and surfactant content of lung increases. This occurs as plasma cortisol and PGE₂ concentrations increase. As PGE₂ infusions decrease tracheal fluid production and increase cortisol concentration, the increase in PGE₂ concentration before delivery may contribute to the above changes. To test this hypothesis, we suppressed PG production by continuously infusing Meclofenamate (0.8 mg/kg/h), a PG synthesis inhibitor, into 5 fetal sheep (Mec) for 5-13d until delivery (133 to 150d gest). We infused solvent into 4 controls (Con) for 5-11d (131 to 146d gest). Both groups had similar daily HR, BP, pH, PO₂, and PCO₂.

DAYS BEFORE DELIVERY: 5 4 3 2 1 0
PGE₂ concn. Mec (n=3) 7 9 3 2 14 -
(pg/ml) Con (n=4) 179 183 158 142 406 734
Tracheal fluid Mec (n=5) 2.8 2.9 2.5 2.1 1.6 0.6
prodn. (ml/kg/h) Con (n=4) 3.4 3.3 3.1 3.0 2.2 1.4
Cortisol concn. Mec (n=4) 29 19 45 20 59 93
(ng/ml) Con (n=4) 9 20 22 39 52 73
Meclofenamate infusion decreased PGE₂ concentration, but in both groups, tracheal fluid production and cortisol concentration were similar. Surfactant content of lungs of Mec were lower than of Con ($P=0.1$). Birthweight and lung weight were the same in both groups. We conclude that normal lung growth and the changes in tracheal fluid production and cortisol concentration before delivery are not dependent on high plasma PGE₂ concentrations. (Supported by USPHS HL27356, Pulmonary SCOR, and ALA fellowship.)

1853 CALIBRATION OF THE RESPIRATORY INDUCTIVE PLETHYSMOGRAPH IN INFANTS. Robert H. Warren, Sheila H. Alderson (Spon. by Robert H. Fiser) University of Arkansas for Medical Sciences, University Hospital, Department of Pediatrics, Little Rock, Arkansas

Following appropriate calibration of the respiratory inductive plethysmograph (RIP) utilizing simultaneous integrated pneumotachography (PNT) as the volume standard, pulmonary function can be measured without an airway connection. Scaling factors that describe the electrical gains of the rib cage (RC) and abdomen (AB) bands were calculated with a single position least squares equation (SPLSQ) technique in 70 awake infants (17 supine, 51 prone). Calibration utilizes 2 breaths with different RC/PNT and AB/PNT ratios for gain factor calculation. Validation was performed by assessing % deviation of RIP volume from PNT volume. Accuracy was also evaluated following reversal of body position.

Validation	Breaths	±10%Dev.	±20%Dev.	Mean V _T (ml)
		RIP/PNT	RIP/PNT	RIP PNT r
1st Position 70 runs	2624	2141(82%)	2566(98%)	20.1 20.3 .96
2nd Position 46 runs	1683	1268(75%)	1620(96%)	19.5 19.6 .96

Initial calibration procedure time ranged between 10 and 15 minutes. Following position change, 24 infants could not be revalidated due to agitation. This study suggests that the SPLSQ technique provides time-efficient and accurate calibration of RIP in the infant. Accuracy is maintained through position change if the infant remains quietly awake.

1854 COMPARISON OF SINGLE POSITION CALIBRATION TECHNIQUES OF THE RESPIRATORY INDUCTIVE PLETHYSMOGRAPH. Robert H. Warren, Sheila H. Alderson, (Spon. by Robert H. Fiser) University of Arkansas for Medical Sciences, University Hospital, Department of Pediatrics, Little Rock, Arkansas

We compared a single position least squares equation (SPLSQ) calibration technique with a previously reported single position graphic (SPG) calibration technique (Am Rev Resp Dis 129:A256, 1984) in 44 supine newborn infants. Calibration requires calculation of calibration factors for rib cage (RC) and abdomen (AB) transducers utilizing simultaneous integrated pneumotachography (PNT) as the volume standard. The SPLSQ technique utilizes selection of 2 breaths with different RC/PNT and AB/PNT ratios. The SPG technique sums all volumes from a 20 s run of breaths, denoted as SRC and SAB and sets them equal by a multiplier (K) i.e., $KSRC=SAB$ for calibration factor calculation. Calibration factors were obtained by both techniques on the same 20 s run of breaths. Validation was performed by comparing volumes obtained simultaneously by RIP and PNT as listed:

Validation	Breaths	±10%Dev.	±20%Dev.	Mean V _T (ml)
		RIP/PNT	RIP/PNT	RIP PNT r
SPLSQ	1476	1286(87%)	1449(98%)	20.1 20.5 .96
SPG	1306	753(58%)	1099(84%)	19.2 20.1 .83

Both methods are comparably time efficient. Our validation results suggest that the SPLSQ technique has greater accuracy than the SPG technique.