1243 ALTERATIONS IN LUNG MECHANICS AND THE WORK OF BREATH-ING OF PRETERM LAMBS ON POSITIVE END EXPIRATORY PRESSURE (PEEP). Thomas H. Shaffer, Peter A. Koen, James D. Ferguson, and Maria Delivoria-Papadopoulos. University 1243

James D. Ferguson, and Maria Derivoria-rapadopulda. Oniversity of Pennsylvania School of Medicine, Departments of Pediatrics and Physiology, Philadelphia, PA 19174. The effect of PEEP on lung mechanics and on the work of breathing was studied in 8 preterm lambs delivered by cesarean

section at 134 days gestation. Indwelling arterial, venous, and tracheal cannulae were placed before clamping the cord. Assisted mechanical ventilation was performed at a tidal volume of 15/ml/ Kg and a rate of 30-40/min at F102 of 0.95. Measurements of in-traesophageal and tracheal pressures, air flow, tidal volume, and functional residual capacity enabled calculation of dynamic and functional residual capacity enabled calculation of dynamic compliance ( $C_L$ ), specific compliance ( $C_S$ ), inspiratory resistance ( $R_I$ ), expiratory resistance ( $R_E$ ), and work of breathing at 0, 3, 6, and 10 cm H<sub>2</sub>O PEEP. Dynamic compliance and C<sub>5</sub> decreased by 0.11 ml/cm H<sub>2</sub>O/Kg and 0.0051 1/cm H<sub>2</sub>O per cm H<sub>2</sub>O PEEP respective-ly for PEEP above 3 cm H<sub>2</sub>O. Functional residual capacity increased (p<0.005) by 1.6 ml/Kg per cm H<sub>2</sub>O PEEP. Inspiratory resistance increased significantly (p<0.05) only between 0 and 6 cm H<sub>2</sub>O PEEP (3, 6, and 10 cm H<sub>2</sub>O). As compared to 0 cm H<sub>2</sub>O PEEP (11.9 ± 2.5 SE x 10<sup>6</sup> ergs/min), the work of inspiration per unit time decreased 17% at 3 cm H<sub>2</sub>O and increased 10% and 80% at 6 and 10 cm H<sub>2</sub>O PEEP respective. Gecreased 1/4 at 5 cm H20 and increased 104 and 004 at 6 and 10 cm H20 PEEP respectively. These data suggest that it is mech-anically easier to breathe at low levels of PEEP (3 cm H20) than without PEEP or at high levels of PEEP (10 cm H20). (Supported by USPHS Grants HL19402 & HL15061)

PHOSPHOLIPID BIOSYNTHESIS AND SECRETION IN CULTURES 1244 OF TYPE II ALVEOLAR EPITHELIAL TUMOR CELLS: THE

EFFECT OF THEOPHYLLINE. Donald L. Shapiro, Seamus A. Rooney, Linda L. Nardone, E.K. Motoyama, J. Munoz (Spon. by J.B. Warshaw) Yale University School of Medicine, Department of Pediatrics, New Haven, Connecticut. A continuous cell culture line derived from a human lung tumor

which has morphological characteristics of type II alveolar epiwhich has morphological characteristics of type II alveolar epi-thelial cells was studied for the ability to synthesize and secrete phospholipid. The cells contained 0.213 mg lipid/mg pro-tein of which 41% was phosphatidylcholine (16% of the phosphati-dylcholine was disaturated). The specific activities of choline kinase and choline phosphotransferase were 381 and 1030 pmoles/ min/mg protein, respectively. The cells incorporated choline into phosphatidylcholine (28% of the phosphatidylcholine was di-esturated) and escrated phosphatidylcholine into the culture saturated) and secreted phosphatidylcholine into the culture medium (28% of the phosphatidylcholine was disaturated). To study the influence of the adenylate cyclase-cyclic AMP system on these processes, cells were cultured in the presence of  $10^{-3}$ M on these processes, calls were cultured in the presence of 10 M theophylline. Lipid content and composition were not signifi-cantly changed. Choline kinase and choline phosphotransferase specific activities were 172% and 88% of control values, respec-tively. Choline incorporation into phosphatidylcholine was 209% of the control value (28% of the phosphatidylcholine was disaturated). Acute stimulation of phospholipid secretion was not produced by theophylline addition. Homogeneous cell cultures can be used to study the effects of hormones on phospholipid biosynthesis and secretion.

1245 PULMONARY WASHINGS AND BLOOD IN PULMONARY ALVEOLAR PROTEINOSIS (PAP). Lance Sieger, Joan A. Stratton and Karlman Wasserman (Spon. by Bascom F. Anthony) UCLA Sch. Med., Harbor Gen. Hosp., Depts. Peds. & Med., Torrance, Ca. Pulmonary alveolar proteinosis is a diffuse pulmonary disease of obscure etiology characterized by abnormal accumulations of phospholipids in the lung. Despite severe pulmonary disabilities there is a striking absence of inflammatory cells and fibrosis in the lungs of these patients. We have examined the lung wash-ings and blood from five patients with this disease in an attempt to discover whether there are any inhibitors of the normal in-flammatory responses locally or systemically. The complete pe-ripheral blood counts and numbers of T and B lymphocytes and monocytes were entirely normal in all patients. The cellular components of the lung washings were primarily mononuclear cells which exhibited histochemical and surface characteristics typical of alveolar macrophages (AM). Morphologically, these AM were many times larger than AM from control patients and were filled with amorphous material. The lung washings of the patients in-hibited Con A and pokeweed mitogen stimulation of allogenic pe-ripheral blood lymphocytes by >90%, but had no significant ef-fects on PHA stimulation. Their sera inhibited stimulation by all three mitogens >95%. This inhibition was not due to cyto-toxicity. When the lung washings were injected into normal rabbit peritoneal cavities, there was no inhibition of accumulation of either PMNs or peritoneal macrophages as stimulated RNA synthesis in vitro by rabbit AM.

PLASMA RENIN ACTIVITY IN THE RESPIRATORY DISTRESS 1246 SYNDROME. Richard L. Siegler, Margaret B. Walker, William Jubiz (spon. by Lowell A. Glasgow). Univ. of Utah Col. of Med., Univ. and VA Hosp., Dept. of Ped. and Med.,

of litah Col Salt Lake City.

Salt Lake City. There is general agreement that long-term hypoxemia stimulates the renin-angiotensin system, but the effects of short-term hypoxemia are less certain. For these reasons, we measured plas-ma renin activity (PRA) by radioimmunoassay in 14 hypoxemic in-fants, age 2-3 days, with severe respiratory distress syndrome (RDS). The same studies were repeated 5-7 days later, after the infants' condition had improved markedly. Comparisons were also made with a group of age and weight matched normal premature in-fants (n=6), and with a group of age matched normal term infants (n=10). The following results (mean<u>+</u>5E) were obtained. 

	PKA (19/11	17107	
RDS Infants 2-3 days age	RDS Infants 7-10 days age	Normal Prematures	Normal Term Infants
12.9 <u>+</u> 2.6	11.4 <u>+</u> 2.7	10.8 <u>+</u> 2.3	11.8 <u>+</u> 2.0
The PRA in the	2-3 day old infants	with severe RDS	did not corre- fer signifi-

late significantly with their PO<sub>2</sub>; and did not differ signifi-cantly from the PRA levels obtained following their clinical im-provement 5-7 days later. Moreover, the PRA in the RDS infants did not differ significantly from the levels in the normal pre-mature and term infants. Thus, short-term hypoxemia secondary to RDS does not appear to stimulate PRA.

	THE ROLE	OF PULMONARY STEROID 11-REDUCTASE	
1247	ACTIVITY	IN LUNG MATURATION IN THE FETAL RA	ΔT
	Barry T.	Smith (Spon.by H.W.Taeusch) Queen	S

Univ., Dept. of Paediatrics, Kingston, Ontario, Canada. Fetal glucocorticoids play a role in the biogenesis of adequate pulmonary surfactant. The fetal lung poss-esses the necessary enzyme (ll-reductase) to convert inactive but abundant 11-keto steroids to their active 118-hydroxy configuration.

llß-hydroxy configuration. Fetal rats were injected on day 17 with ll-ketoprogesterone which blocks ll-reductase activity. On day 21 injected fetuses had larger lungs than vehicle-injected controls (147.6±9.8 mg vs 132.8±9.5, p<.001) with reduced ll-reductase (9.9±3.3% vs 51.7±6.1, p<.001).Lungs of injected fetuses did not retain air upon inflation as did controls and their content of saturated phosphatidylcholine was reduced whether considered as content/unit lung weight (1.42±.09 mgP/g wet weight vs 1.77±.11, p<.001) or as content professional (.20±.02 mgP/lung vs .24±.02, p<.001). Vehicle inject-choline compared to unoperated controls (1.77±.11 mgP/ choline compared to unoperated controls (1.77±.11 mgP/ g wet weight vs 1.66±.11, p<.01), suggesting stress induced acceleration of lung maturation.

These results suggest that pulmonary steroid ll-re-ductase activity facilitates fetal lung development perhaps by maintaining high pulmonary concentrations of active glucocorticoid. (Supported by the M.R.C.).

## VENTILATION AND PERFUSION ASSESSMENT BY ELECTRICAL MPEDANCE PLETHYSMOGRAPHY. James A. Spence, Tzong R. Weng, George Polgar and Jan Nyboer. Wayne State Univ. 1248 Sch. of Med. Childrens Hosp. Mich. Dept. Peds. & Physiol, Detroit

Sch. of Med. Childrens hosp. mich. Dept. reds. or mysicily better Tetrapolar electrical impedance plethysmography has been employed in an attempt to describe regional and total ventilation and perfusion profiles at tidal volume range in patients with dif-ferent pulmonary pathology. Atraumatic and requiring minimal coferent pulmonary pathology. Atraumatic and requiring minimal co-operation, the determinations were performed on patients ranging in ages from 8 mo to 18 yrs. Resistive impedance changes of a 0.8 ma,50 kHz constant current were detected from 1.5 cm<sup>2</sup> electrodes linearly mounted in adhesive belts. These belts were applied hor-izontally above the diaphragm in 6 areas corresponding to upper, mid, and lower regions of the lungs. Interelectrode distances were varied to suit both patient size and the depth of tissue to be studied. Even current distribution found from isoresistance studies allowed the assumption of favorable resolution within the be studied. Even current distribution found from isoresistance studies allowed the assumption of favorable resolution within the sample region. Deflections representing ventilatory and perfusion events were recorded simultaneously with their derived velocities. From these blood flow pulses could be obtained using a forward extrapolation method. The data was then converted into ventilat-ion and perfusion indices. The regional distribution of the ratios of ventilation and perfusion values was different from that of other methods because these values were not corrected for unit other methods because these values were not corrected for unit volume. In 6 cases of atelectases, hypoperfusion, consolidation, and lung abscess confirmed by conventional methods, low ventil-ation and perfusion impedance indices corresponded with diseased areas, whereas they were higher in more normal lung fields.