HYPEROXIC LUNG INJURY: PULMONARY PROSTAGLANDIN (PG) 1786 INCREASES PROCEDE MORPHOLOGIC CHANGES. Joseph R. Hageman, Stephen Lee, Michael Cobb, Lewis Smith, Lauren Pachman, and Carl E. Hunt. Northwestern University, Departments of Pediatrics and Medicine, Chicago, IL. To assess the role of PGs in the early development of hyper-

oxic lung injury, 11 adult rabbits with chronically implanted oxic ling injury, it adult rabbits with chronically implanted arterial and venous catheters were exposed to >95% O₂ or air for 24 hours. At 24 hours, PaO₂ was 524 ± 41 (SD) and 92 ± 10 Torr in the hyperoxic and control rabbits. PG E₂, PG 6-keto F₁_{AC} and thromboxane (TX) B₂ levels (pg/ml) were measured by RIA in plasma and in bronchoalveolar lavage (BAL) supernatant. Protein (P) was measured in serum and BAL; BAL WBC and % PMN were also measured. Hypervise programs for call 24 hours did not acuse a measured. Hyperoxic exposure for only 24 hours did not cause a significant increase in BAL P (Table, Mean ± SD) or any light BAL P BAL:Plasma (pg/ml) BAL:Plasma (pg/ml)

TX B2 0.6 ± 0.4 1.4 ± 1.5
 GROUP
 PMN (8)
 (ug/ml)
 PG E2

 CONTROLS
 0.6 ± 0.7
 60 ± 30
 0.4 ± 0.1

 HYPEROXIC
 3.6 ± 1.7
 90 ± 50
 1.5 ± 1.8
PG E2 PG 6-keto F1 =< 0.4 ± 0.1 0.4 ± 0.2 1.0 ± 0.5 NS 4.05 p <.05 NS NS .025 N or electron microscopic changes. However, BAL % PMN and the NS BAL:plasma PG 6-keto F1 ratio both increased significantly. BAL:plasma PG 6-keto $F_{1\infty}$ ratio both increased significantly. The increases in BAL:plasma PG E₂ and TX B₂ were not significant. In summary, increased PG 6-keto $F_{1\infty}$ may be an early marker of hyperoxic lung injury. In addition to providing further support for a relationship between PGs and the development of hyperoxic lung injury, these results suggest a potential preventive role for PG inhibitors.

SURFACE ACTIVE MATERIAL (SAM) AND COMPLIANCE CHANGES 1787 DURING RECOVER FROM EXPERIMENTAL HYALINE MEMBRANE DISEASE (HMD). J.C. Jackson, S. Palmer, T.A. Standaert, J. Murphy, W.E. Truog, D.E. Woodrum, R.J. Badura, G.K. Sorensen, J.F. Watchko, W.A. Hodson. Dept. of Pediatrics, Univ. of Washington, Seattle, WA. It is not known whether second

It is not known whether recovery from HMD begins in spite of It is not known whether recovery from hmb begins in spite of a deficiency of SAM or only after return to some critical value. Eight of 12 M. <u>nemestrina</u> primates delivered at 80% of normal gestation developed HMD and were sacrificed at defined stages in their recovery. Postmortem deflation stability (%total lung capacity [TLC] at P=10cm H₂O pressure) and diphosphatidylcholine (DPC) quantities in unlavaged lung tissue and in bronchoalweolar Davage were compresed to controls as well as four healthy term lavage were compared to controls as well as four healthy term 3-4 week old infants.

	%TLC at P=10	Tissue DPC mg/gm dry lu	Lavage DPC mg/gm dry lung
HMD no recovery	57.3±11.0	15.0±3.5	0.59±0.28
HMD early recovery	82.0±2.8	15.9	2.2
HMD late recovery	85.7±3.1	30.4±4.0	10.2±3.2
Healthy control	87.8±5.4	29.7±4.6	15,0±8.9
3-4 wk old term	78.0±5.0	18.0±1.3	2.9±0.48
We conclude that 1) quantities in anima	the dispa ls with HM	rity between to D suggests a t	tissue and lavage DPC problem in release of

SAM rather than tissue production and 2) clinical recovery and improvement in deflation stability occur despite DPC levels that are quite low compared to control but similar to older infants. (Supported by NIH#HL19187 and #RR00166, Fellow of American Lung Association)

REUTILIZATION (RU) OF SURFACTANT (NS) PHOSPHATIDYL- **1788** CHOLINE (PC) IN ADULT RABBITS (R). H.C. Jacobs, <u>M. Ikegami, A.H. Jobe, D. Berry</u>, Dept. of Pediatrics, Harbor-UCLA Medical Center, UCLA School of Medicine, Torrance, CA Several studies have demonstrated RU of NS PC in developing and adult R. The magnitude of RU in adult R has not been deter-mined. We injected 87 1 kg R with two solutions simultaneously. [¹⁴C]palmitate was given IV and a solution of [³H]choline labeled NS plus [³²P]dipalmitoyIPC (DPC) was injected intratracheally (IT). R were sacrificed from 10 min to 72 hrs after injection. From each R we collected a complete alveolar wash (AW) and iso-(II). R were sacrificed from 10 min to 72 hrs after injection. From each R we collected a complete alveolar wash (AW) and iso-lated a lamellar body (LB) fraction. We measured total [³H]PC and [³²P]PC recovered in the AW and [¹⁴C]PC specific activity (SA) in the AW and in LB. From curves of [¹⁴C]PC SA in the LB and the AW vs time, we calculated the flux of PC from the LB into the AW (PC flux) and the turnover times (Tt) for alveolar PC (Tt =total AW PC/PC flux). A computer generated equation describing the total AW [³H]PC vs time was obtained and used to independent-ly calculate the PC flux, the Tt, the % RU of NS PC and the LB PC pool size. The results are shown in the table. Tt PC Flux % RU IV 6.38 h 1.64 µmO] PC/h 31% .92 Also, the ratio of [³H]PC to [³²P]PC in the AW did not change with time. We concluded that 1) IT and IV labeling gave compar-able results. 2) IT NS and the added DPC behaved metabolically like endogenous NS. 3) That RU of PC in adult R (31%) is less than that of developing R (>90%).

SEQUENTIAL CHANGES IN ALVEOLAR-CAPILLARY MEMBRANE SEQUENTIAL CHANGES IN ALVEOLAR-CAPILLARY MEMBRANE **O1789** PERMEABILITY IN HYALINE MEMBRANE DISEASE (HMD). Ann L. Jefferies, Geoffrey Coates, Hugh M. O'Brodovich (spon. by J.C. Sinclair) McMaster University, Depts. of Pedia-trics and Radiology, Hamilton, Ontario, Canada L8N 3Z5 Because HMD is complicated by increased lung water and protein content, alveolar-capillary membrane permeability may be increas-ed. Using aerosolized 99m technetium-diethylene triamine penta acetate (Tc-DTPA) as previously described (ARRD 127(4):299, 1983), we assessed pulmonary epithelial permeability on 28 occasions in 13 intubated infants, 28 to 36 weeks gestation, with HMD. The lungs were insufflated with 10-15 uCi of Tc-DTPA and counts over the upper right chest recorded for 30 minutes with a NAI scintil-lation probe. Pulmonary half-life (Tb₂) of Tc-DTPA was calculat-ed from the slope of the clearance curve. Infants were studied as soon after intubation as possible and 2-3 times subsequently until extubation. In all 11 studies done within 72 hours of birth, the clearance curve was biphasic with a rapid phase Tb₂ of 1.6 ± 0.2 min (mean ± SE). Normal adults have a monophasic curve with Tb₂ of 45-80 minutes. In 7 of the 9 studies done just prior to extubation on infants who recovered (mean age 6 days), the curve had changed to monophasic with Tb₂ of 48.1 ± 8.0 min. Two infants remained 02 and ventilator dependent and had persistent biphasic curves past 1 week of age with a rapid phase Tb₂ of 1.4 \pm 0.6 min. We conclude that pulmonary clearance of Tc-DTPA in infants with HMD in the first 3 days of life is rapid, suggest-ing increased permeability to small solutes, and as HMD resolves, permeability approaches normal adult values. Persistent lung disease is associated with persistent rapid clearance. disease is associated with persistent rapid clearance.

INCREASED LUNG PROTEIN PERMEABILITY OF PREMATURELY 1790 DELIVERED AND VENTILATED LAMBS. A.H. Jobe, <u>M. Ikegami, H.C. Jacobs, D. Berry</u>, Dept. of Pedi-atrics, Harbor-UCLA Medical Center, UCLA School of Medicine,

atrics, Harbor-UCLA Medical Center, UCLA School of Medicine, Torrance, CA. Groups of 8 lambs were delivered at 122, 135 or 146 days (d) gestational age (GA) and ventilated. Lambs at 122 d were treated with natural sheep surfactant (NS). Mean blood gas values and ventilator settings were similar for all groups. The lambs at 146 d required lower peak inspiratory pressures (PIP) to normal-ize pCO₂ values relative to the other lambs (15 vs 24 cm H₂O). To control for this variable, 4 lambs at 146 d were ventilated at 25 cm H₂O PIP with added CO₂ to normalize pCO₂. The exit from the airways of ¹²⁵I-albumin added to fetal lung fluid at deli-very, the entrance into the airways of ¹³¹I-albumin given by vas-cular injection, the protein in alveolar washes (AW), and % re-covery of labeled albumin in lung tissue (corrected for blood volume) were measured after 3 hr of ventilation. % Recovery of Injected Dose in AW (M+SE)

	% Recovery	of Injected	Dose in AV	(M+SE)
	122	135	146	146+C02
¹²⁵ I-albumin	50.2±1.6	62.9±4.4	78.9±2.9	72±4
¹³¹ I-albumin	3.3±4	2.3±0.3	0.6±0.1	0.7±0.1
Mg Protein AW/kg	140±14	97±9	73±7	52±3
The amount of ¹²⁵ I th	at left the	alveoli incr	eased, the	amount of
¹³¹ I that entered the	alveoli inc	reased, and	total prote	ein in-
creased as GA decrease	ed (p values	<0.05, ANOV	A). There	is an in-
creasing protein leak	with decrea	ising GA in v	entilated 1	ambs that
is independent of NS	treatment or	the PIP rec	uired to ve	entilate
the lambs.			201	

LIMITS OF HIGH FREQUENCY JET VENTILATION IN SMALL SUB

LIMITS OF HIGH FREQUENCY JET VENTLATION IN SMALL SUB **17791** LIMITS OF HIGH FREQUENCY JET VENTLATION IN SMALL SUB manian, (Spon. by P.L. Calcagno). Dept. of Pediatrics Georgetown Univ. Med. Ctr., Washington, D.C. To define limits of injector size/internal compressible volume (ICV) of the jet tubing in small subjects, we studied anesthetized paralyzed cats using the MK-800 jet ventilator & noncompliant tub-ing with ICV of 14 ml. FIO2 of 1.0 & 30% duty cycle remained con-stant. In part I the injector size was varied from #12,14,16 to 18 (2.16-1.06mm)at rates of 150 & 300/min with normal and noncompliant lumos. The driving pressure was adjusted to keep a constant mean (2.16-1.06mm)at rates of 150 & 300/min with normal and noncompliant lungs. The driving pressure was adjusted to keep a constant mean airway pressure (MAP) for each set of conditions. In part II the ICV was + from baseline(B) to 1.5B, 2B and 3B through the same sequence as in part I, using #14 & #16 injectors. Tracheal press-ure tracing was recorded. Despite constant MAP, PCO2 rose with + injector diameter though with normal lungs at 150/min PCO2 was normal even with the smallest injector (#18). Increasing ICV up to 2B bed no offoct with #14 injector (#18). normal even with the smallest injector (#18). Increasing 10 up to 3B had no effect with #14 injector or with normal lungs. With #16 injector and stiff lungs, PC02 rose as ICV $\frac{1}{2}$, $\frac{*p}{2} < 0.05$ (1) 12 14 16 18 (II) B 1.5B 2B 3B Normal lung - 150 29 26 33 42* 26 25 28 27 Normal lung - 200 27 26 33 42* 26 25 28 27 1.5B 25 40 27 42 Normal Lung - 300 Stiff Lung - 150 30 25 24 31 27 45 32 62* 47* 41 27 38 31 45 38 44*

Stiff Lung - 300 29 37 62* 39 54 56* $\frac{x}{x} \frac{PCO_2}{PCO_2}$ with different injectors (I) & ICV with #16 injector (II) When an unfavorable relationship exists between injector size, driving pressure & ICV excessive compression of gas in the patient circuit results in loss of pulsatility of gas flow & inadvertent PEEP leading to CO2 retention.