●1822 BREATHING MOVEMENTS TRANSIENTLY INCREASE LUNG VOLUMES IN FETAL SHEEP. DT Murai, CH Lee, LD Wallen, JA Kitterman, Univ of TX Health Sci Ctr & Univ of CA, Cardiovasc Res Inst & Depts of Ped, San Antonio & San Francisco.

Recent studies indicate that fetal breathing movements (FBM) stimulate fetal lung growth. We chronically studied 18 fetal sheep to determine if FBM affect lung growth by transiently increasing the total volume of fluid (TVF) in the potential airways and air spaces. In 14 fetuses, the trachea was ligated; a catheter with an exteriorized loop diverted all tracheal fluid into a soft intrauterine bag. In 4 fetuses, the trachea was patent; we aspirated tracheal fluid through a small catheter after occluding the glottis with an inflated balloon tipped catheter. On alternate days, we aspirated fluid from the lungs after >9 minutes of either FBM or no FBM. The order of collection varied. Using inulin dilution, 64.8±9.6% of the TVF was aspirated through the tracheal catheters (mean ±SD; similar after FBM or no FBM). In every fetus, the volume aspirated after FBM was greater than that aspirated after no FBM. These volumes, in fetuses with the ligated trachea, were 20.5±7.9 ml/kg after no FBM and 28.9±9.8 ml/kg after FBM ($p<0.01$). In fetuses with the patent trachea, these volumes were 20.7±2.5 after no FBM and 24.5±2.4 ml/kg after FBM ($p<0.05$). The daily incidence of FBM (both groups) and the tracheal fluid production rate (ligated group) were similar on both study days for each fetus. We conclude: FBM intermittently increase the volume of fluid that can be aspirated from the fetal lungs. This suggests that the TVF in the potential airways and air spaces also increases; this increase in volume may stimulate lung growth. (USPHS HL-27356)

1823 THE EFFECTS OF PROSTAGLANDIN E_2 (PGE_2) AND MECLOFENAMATE (M) ON BREATHING MOVEMENTS IN FETAL SHEEP ARE NOT MEDIATED THROUGH PERIPHERAL CHEMORECEPTORS. DT Murai, CH Lee, LD Wallen, JA Kitterman, Univ of Texas Health Sci Ctr, San Antonio & Univ of Calif, San Francisco, Cardiovas Res Inst & Dept of Ped, San Antonio and San Francisco.

PGE_2 inhibits fetal breathing movements (FBM); the prostaglandin synthetase inhibitor, M, stimulates FBM. To determine if these effects are mediated through the peripheral chemoreceptors, we studied 13 chronically catheterized fetuses; 7 had bilateral sections of carotid sinus and vagus nerves; 6 had sham operations. FBM (by tracheal catheter) and electrocortical activity (ECoA) were recorded continuously. After a control (C) period (19.9±4.5h; mean ±SD) we infused PGE_2 (0.6±0.2 µg/kg/min) or M (0.4±0.2 mg/kg/h) for 20.0±2.1 h per infusion. Infusions were separated ≥ 48 h. The incidences and amplitudes of FBM were lower in the denervated group (Table).

	FBM(%time)		Tracheal Pressure (torr)			
	Denervated	Sham	Denervated		Sham	
			Ave	Max	Ave	Max
C	18.9± 7.7¶	31.5±7.6	2.8±0.6¶	7.5±1.6¶	4.0±0.8	10.0±0.8
PGE_2	5.7± 2.9°	8.5±3.9°	-	-	-	-
M	41.5±19.9¶°	84.1±6.8°	4.4±0.8°	9.7±1.8¶	6.5±2.4°	14.0±2.7°

(values=mean±SD; °P<0.05 compared to C; ¶P<0.05 compared to Sham). However, the % change from C during infusions was similar in both groups as were the ECoA, arterial pH, PO_2, PCO_2 and pressures. We conclude that peripheral chemoreceptor denervation significantly affects FBM; however the effects of PGE_2 and M on FBM are not mediated through the peripheral chemoreceptors. (USPHS HL-27356).

†1824 PERIPHERAL CHEMORECEPTOR DENERVATION AFFECTS FETAL BREATHING MOVEMENTS (FBM) IN SHEEP. DT Murai, CH Lee, JA KITTERMAN, LD WALLEN, Univ of TX Health Sci Ctr, San Antonio & Univ of Calif San Francisco, Cardiovas Res Inst & Dept of Ped, San Antonio and San Francisco.

FBM in chronic ovine fetal preparations are not affected by vagus or carotid sinus nerve sections. However, the aortic bodies may acquire respiratory chemoreceptivity after carotid body denervation. To better define the role of these chemoreceptors on the control of FBM, we chronically studied 14 fetuses; 7 had bilateral section of carotid sinus and vagus nerves and 7 had sham operations. FBM (by tracheal catheter) and electrocortical activity (ECoA) were recorded continuously after surgery. The incidence of FBM and amplitudes of tracheal pressure during 2 periods, 1-5 and 6-13 postoperative (PO) days were:

	FBM (% time)						Tracheal Pressure(torr)			
PO Day	1	2	3	4	5	6-13	3		6-13	
							ave	max	ave	max
Denerv	4.5	10.1	11.4	21.7	20.5	17.0	2.5	7.4	2.6	6.7
	(5.2)	(6.7)	(9.4)	(10.9)	(11.5)	(7.2)	(0.4)	(2.0)	(0.6)	(1.7)
Sham	34.1	38.1	35.8	35.2	31.5	30.9	5.1	12.3	3.9	10.2
	(17.3)	(10.2)	(13.3)	(9.2)	(6.8)	(6.5)	(0.8)	(4.1)	(0.7)	(1.5)

[Values=X(SD); all comparisons of denerv to sham, $p<0.05$ except day 5.] ECoA, arterial pH, PO_2, PCO_2 and blood pressures were similar in both groups. Throughout this study, the daily mean incidence of FBM and tracheal pressures during FBM in the denervated group were lower than in the sham group. We conclude that total peripheral chemoreceptor denervation significantly affects the incidence and amplitudes of FBM in sheep. (USPHS HL-27356).

1825 PNEUMOTHORAX IN MECHANICALLY VENTILATED INFANTS: ASSOCIATION WITH BRAND OF SUCTION CATHETER. Saul Z. Newman, Jeffrey J. Pomerance, Sharyn J. Brown. UCLA School of Medicine, Cedars-Sinai Medical Center, Department of Pediatrics, Los Angeles.

Pneumothorax (PT) remains a source of significant morbidity and mortality in the infant requiring mechanical ventilation. The incidence of PT was evaluated in our nursery over a one year period (Period A) during which one brand of suction catheter was used. In the ensuing 5½ months (Period B), a second brand of suction catheter was used. Excluding infants with hypoplastic lungs, PT occured in 26 of 127 (20%) ventilated infants in Period A, and in 4 of 46 (8.7%) in Period B ($X^2=3.27$; $.05<p<.10$). In low birth-weight (LBW) infants (<1250 gms), 17 of 53 (32%) sustained PT in Period A, and 3 of 14 (21%) in Period B (p=NS). In Period A, 8 of 53 (15%) LBW infants sustained low pressure PT (peak inspiratory pressure <20 cm H_2O; range 8-20; $\bar{x}$=15). Three of these infants later died. In Period B, none of 14 (0%) LBW infants sustained low pressure PT ($X^2=2.40$; $.10<p<.20$). We intend to complete a full year's experience with this second brand of suction catheter.

A factor in the preference by nursing personnel for a particular brand of catheter, is it's ease of passage through the endotracheal tube, stiffer catheters passing more easily. Increased stiffness, however, may increase the risk of trans-bronchial puncture. Two of our low pressure PT infants, in fact, had large "plugs" suctioned prior to air leak being noted. Routine monitoring of the incidence of pneumothorax as it relates to the brand of suction catheter utilized, may be advisable.

1826 ELECTROLYTE COMPOSITION OF THE ALVEOLAR SUBPHASE IN ANESTHETIZED RABBITS. Dennis W. Nielson (Spons. by Michael A. Simmons), University of Utah, Department of Pediatrics, Salt Lake City.

The alveolar epithelium secretes an aqueous fluid, the subphase (AS), into its lumen that may have a number of important effects on surfactant function and that might reflect in its composition some mechanisms by which the alveolar epithelium contributes to control of lung water. Other studies have documented in vitro effects of electrolytes on surfactant function and active transport of ions with associated water fluxes by other respiratory epithelia. Therefore, we undertook a direct study of the ionic composition of the AS. Rabbits were anesthetized and connected to a respirator with a tracheal cannula. The exposed right upper lobe was restrained, and alveoli visible through the pleura were punctured with microelectrodes selective for Na^+, K^+, Ca^{++} and Cl^-, and with a non-selective KCl electrode. In the AS, Na^+ = 135 ± 5 meq/L (mean ± SD, n = 5), K+ = 7.3 ± 0.7 (n = 5), Ca^{++} = 3.2 ± 0.4 (n = 5) and Cl^- = 103 ± 5 (n = 19). The alveolo-pleural potential difference (PD) was -3.5 ± 0.8 mV (lumen negative, n = 34). Only alveolar K^+ was different from its serum concentration ($p<0.001$). Thus, we have evidence that there is little or no active transport of Cl^- and that there might be active exchange of Na^+/K^+ that is not explained by the PD. Such a mechanism might be associated with a flux of water from the alveolar lumen and might explain in part the small volume of water in the AS. Finally, the alveolar Ca^{++} is much higher than that found in fetal lung liquid. This higher Ca^{++} facilitates surfactant spreading (B.J. Benson, etal, in press).

●1827 IS THERE A CHLORIDE PUMP IN MATURE ALVEOLAR EPITHELIUM? Dennis W. Nielson (Spon. by Michael A. Simmons), University of Utah, Department of Pediatrics, Salt Lake City,

The alveolar epithelium (AE) of fetal lungs actively transports Cl^- into the alveolar lumen, resulting in a high concentration of Cl^- in fetal lung fluid. REcently, we found that in the aqueous subphase (AS) of mature alveoli the Cl^- concentration is equal to that in serum, consistent with little or no active transport of Cl^- by the resting AE. If a Cl^- pump exists in mature AE, then drugs that stimulate or decrease active Cl^- transport in other tissues might alter the concentration of Cl^- in the AS. To test this hypothesis, we measured the concentration of Cl^- in the AS of anesthetized rabbits before and after intravenous terbutaline (0.3 mg/kg), a drug that stimulates active Cl^- transport in other types of respiratory epithelia. The measurements were made by puncturing alveoli visible through the pleura with a Cl^- selective microelectrode. Baseline Cl^- = 98 ± 5 meq/L (mean ± SD, n = 5). The Cl^- increased to 116 ± 4 (n = 5) within 30 to 40 min after the terbutaline, a significant change ($p<0.001$). Three rabbits received intravenous furosemide (5 mg/kg), known to block Cl^- transport in other tissues, 60 min after the terbutaline. In those rabbits the baseline Cl^- = 94 ± meq/L, 30 to 60 min after terbutaline Cl^- = 114 ± 3, and 20 min after furosemide Cl^- = 101 ± 5. Furosemide without prior terbutaline did not change AS Cl^- (n = 5). BAsed on these data, the Cl^- pump found in the AE of fetal lambs is much less active or inactive in mature lungs of rabbits, but it can be stimulated and blocked by appropriate drugs.