1555 THE EFFECTS OF HEMODILUTION ON THE PULMONARY AND SYSTEMIC CIRCULATIONS IN NEONATAL POLYCYTHEMIA. Feizal Waffarn, Katsu Takenaka, Ali Dabestani, Walter Henry, Univ of Calif, Irvine, Calif College of Medicine, Dept of Peds and Medicine, Orange, CA (Sponsored by Ira T. Lott)

The circulatory effects of hemodilution (HD) in neonatal polycythemia (POLY) are unknown. Doppler ultrasound measures of flow velocity integrals (FI) from pulmonary artery (PA) and ascending aorta (Ao) correlate directly with PA and Ao stroke volume, while PA acceleration time (AT) correlates inversely with PA pressure and resistance. We evaluated the sequential changes in these indices in POLY neonates ($\bar{x}$ Hct 69%) and a matched group of normal (NORM) neonates ($\bar{x}$ Hct 57%) at 5, 7, 24 and 48 hrs of age. The POLY group underwent exchange transfusion between 5 and 7 hrs to lower $\bar{x}$ Hct to 51%*. The results follow:

	NORMAL (n=12)				POLYCYTHEMIA (n=11)			
	5hr	7hr	24hr	48hr	5hr	7hr	24hr	48hr
Ao FI (cm)	13.4	13.9	12.8	11.8	13.9	14.5	13.0	13.0
PA FI (cm)	8.7	9.0	11.4*	11.4*	7.7	9.7*	11.5*	11.2*
PA AT (msec)	47.5	53.0	77.2*	83.0*	47.5	59.8*	79.8*	84.9*

* $p<.05$ compared to 5 hr values

There was no difference between the 2 groups compared at each of the 4 time periods suggesting that POLY had no central hemodynamic effect. PA FI and PA AT gradually increased from 5 to 48 hrs in both groups suggesting a decrease in left to right ductal shunt and a fall in PA pressure and resistance. While there was a slightly greater rate of increase in PA FI and PA AT between 5 and 7 hrs (following HD) in POLY compared to NORM, HD provided little overall central hemodynamic benefit.

●1556 CEREBRAL BIOENERGETIC RESERVE AND BLOOD FLOW COMPENSATION IN HYPOXIC NEWBORN LAMBS. L. Craig Wagerle, Maria Delivoria-Papadopoulos, Donald P. Younkin, Britton Chance, John Maris. Univ. of Pennsylvania Sch. of Med., Depts. of Physiology, Biochemistry and Biophysics, Phila., PA.

This study examines the relationship between cerebral energy compounds and tissue oxygen availability. Ten ventilated lambs were studied under 40% N_2O. Cerebral phosphorus-containing compounds (ATP, PCr, and Pi) were measured and intracellular pH (pHi) calculated using surface coil 31-P nuclear magnetic resonance (NMR) spectroscopy. The ratio of spectral peaks for PCr and Pi (PCr/Pi) served as a measure of bioenergetic reserve. Blood flow ($\dot{Q}$) to the specific brain tissue detected by NMR was measured with microspheres (15 μ) and O_2 delivery (OD) calculated ($\dot{Q}$ x O_2 content). NMR spectra were taken continuously and flow measured after 7-9 minutes of hypoxia induced by decreased F_IO_2; arterial O_2 content = 14.0 ± 0.8 (control), 7.0 ± 1.9, 2.2 ± 0.2, and 1.7 ± 0.03 vol % (mean ± SEM). $\dot{Q}$ was increased from control (114 ± 19) to 195 ± 36 and 282 ± 41 ml/min/100g at the two intermediate levels of hypoxia, but decreased during severe hypoxia (105 ± 59 ml/min/100g). PCr/Pi was 1.43 ± 0.03, 1.14 ± 0.10, 0.73 ± 0.08, and 0.54 ± 0.11, respectively. The relationship of PCr/Pi or pHi to O_2 availability identifies a critical range of O_2 availability (~500 μmol/min/100g) below which cerebral bioenergetic reserve decreases linearly (PCr/Pi = OD x 0.00224 + 0.245, r = 0.65; pHi = OD x 0.00071 + 6.655, r = 0.57). The data underscore the importance of flow compensation and maintenance of oxygen delivery to preservation of cerebral energy metabolism during hypoxic stress in the newborn lamb. Inasmuch as the minimal requirement of O_2 availability is 70% of control value (683 ± 91 μmol/min/100g), cerebral energy metabolism appears to be directly dependent on local blood flow alterations during hypoxemia.

1557 PROSTAGLANDIN (PG) SYNTHESIS INHIBITORS AND FETAL BREATHING MOVEMENTS (FBM) IN SHEEP BEFORE DELIVERY. LD Wallen, RI Clyman, CH Lee, DT Murai, FE Mauray, JA Kitterman, Univ of California, CVRI, Dept Ped, San Francisco.

In fetal sheep, plasma PGE_2 concentrations are high and FBM are intermittent, only in low voltage electrocortical activity (ECoA). Before delivery, as FBM decrease, PGE_2 concentrations rise. Meclofenamate, a PG synthesis inhibitor, stimulates FBM even in high voltage ECoA (HVSA), while PGE_2 inhibits FBM. Therefore, before delivery, the rise in plasma PGE_2 concentration may decrease FBM. To test this hypothesis, we suppressed PG production by continuously infusing Meclofenamate (0.8 mg/kg/h) 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 pH, P_{CO2}, P_{O2}, and ECoA. Other results are:

		n	Before Infusion	DAYS BEFORE DELIVERY: >5	3-5	2	1	0
Incidence of FBM (% time)	Mec	5	24	47	51	38	29	4
	Con	4	43	39	37	25	17	4
Incidence of FBM in HVSA (% time in HVSA)	Mec	4	2	35	42	17	18	1
	Con	3	2	3	6	3	4	1
PGE_2 concentration (pg/ml)	Mec	3	144	<1	6	2	14	-
	Con	4	131	131	173	142	406	734

Though Meclofenamate decreased PGE_2 concentrations, both groups had a similar decrease in the incidence of FBM during the two days before delivery. However, Meclofenamate increased the incidence of FBM in HVSA until the day before delivery. We conclude that the decrease in the incidence of FBM before delivery is not dependent on high plasma PGE_2 concentrations.

1558 CARDIAC OUTPUT CHANGES IN NEONATES WITH HYPERBILIRUBINEMIA TREATED WITH PHOTOTHERAPY. Frans J. Walther, Paul Y.K. Wu, Bijan Siassi. Univ. of Limburg, St. Annadal Hosp.,Dept. of Pediatrics, Maastricht, The Netherlands, and Univ. of So. Calif. School of Medicine, LAC-USC Medical Center, Dept. of Pediatrics, Los Angeles, Ca.

Phototherapy (PT) is known to increase peripheral blood flow in neonates, but information on the associated cardiovascular effects is not available. Using pulsed Doppler echocardiography we evaluated cardiac output (CO) and stroke volume (SV) in 12 preterm (BW±SD 2264±425 g, GA 35.2±1.4 w) and 13 term (BW 3161± 488 g, GA 39.0±1.7 w) neonates with and without PT. We concomitantly measured arterial limb blood flow by strain gauge plethysmography and skin blood flow by photoplethysmography.

The results show that with PT CO fell by 6% (from 261±37 to 246±30 ml/min/kg, $p<0.02$) due to reduced SV (from 1.85±0.32 to 1.67±0.29 ml/kg, $p<0.005$). Heart rate increased only slightly (from 143±16 to 149±17/min, NS). Skin blood flow increased by 54% ($p<0.005$) in the preterm and by 27% ($p<0.005$) in the term infants, total limb blood flow increased by 68% ($p<0.05$) in the preterm and by 38% ($p<0.05$) in the term infants. The reduced SV during PT is probably an expression of reduced physical activity of the newborn.

We conclude that (1) CO decreases during PT due to reduced SV, (2) skin blood flow increases during PT with the increments tending to be higher in preterm than in term infants. We speculate that this effect may lead to redistribution of blood flow and has the potential for compromising tissue perfusion in sick newborns with reduced CO.

1559 THE ROLES OF PATENT FORAMEN OVALE SHUNT AND PATENT DUCTUS ARTERIOSUS SHUNT IN THE PATHOGENESIS OF RDS T.J. Wei, H.C. Tien, V. Kamtorn, S. Sun (Spon. by Richard Rapkin) UMD-NJ Med.Sch, Children's Hospital of NJ Dept of Neonatology, Newark, N.J.

In order to study the role of right to left (Rt to Lt) PFO shunt and Lt to Rt PDA shunt in the pathogenesis of RDS, contrast echocardiography was performed in 23 newborns (m GA 32.3 wks, m BW 1690 gms) with RDS requiring mechanical ventilation and FiO_2 of >40%. Shunts were studied daily using realtime 2D ultrasound (HP 77020) with 5 MHZ transducer. Two ml of normal saline was injected through umbilical venous (UV) line (tip in inferior vena cava) and umbilical arterial (UA) catheter (tip at T6 level) to produce echo contrast for PFO and PDA studies respectively. Rt to lt PFO shunt was present in 23/23 patients (100%) who required FiO_2 >40%. The frequency of shunt decreased while FiO_2 requirement decreased; i.e. 55% for FiO_2 between 30-39% O_2 and 0% for FiO_2 <30%. PDA shunt was present in 91% (10/11) and 40% (2/5) of patients requiring >40% and <30% O_2 respectively. Rt to lt PFO and lt to rt PDA shunts coexisted in 76% of patients (16/20) requiring >40% O_2. No simultaneous shunt was found when FiO_2 was <30%. This study systematically and chronologically demonstrates the evidence of Rt to Lt shunt at PFO level (which results in hypoxemia through venous mixing) and also evidence of Lt to Rt shunt through PDA (which leads to increased pulmonary flow and resultant pulmonary edema). Both of these shunts at different levels through different mechanisms contribute to the pathogenesis of RDS.

1560 NORMAL ARTERIAL BLOOD PRESSURES IN THE VERY PREMATURE INFANT. Frederick H. Wirth, Raymond D. Adelman. Departments of Pediatrics, Eastern Virginia Medical School, Children's Hospital of The King's Daughters, Norfolk, Virginia, University of California at Davis.

Hypotension is a frequent diagnosis in the very premature infant and it may be associated with neurological sequellae. Due to the absence of base line data on normal blood pressure in premature infants beyond the first 12 hrs after birth, we designed our study to provide these important clinical data. To facilitate decision making in this important aspect of neonatal intensive care, we used the Hewlett-Packard neonatal monitor model #78205D to hourly record the direct arterial blood pressure on 145 premature infants. The infants were divided into two groups. 79 patients were between the gestational ages of 24-29 wks with a mean birth weight of 1.04 kilo. 66 patients were between the gestational ages of 30-34 wks with a mean birth weight of 1.6 kilo. In each patient group, the blood pressures were blocked into small increments of time thru the sixth postnatal day. The first two days were blocked into eight 6 hr intervals. Days three and four were blocked into six 8 hr intervals. Days five and six were blocked into four 12 hr intervals.

Arterial Blood Pressure - Gestational Age 24-29 Wks

Systolic $\bar{x}$	41	43	45	46	47	49	50	53
2σ	57	59	61	58	61	65	66	67
Diastolic $\bar{x}$	24	26	27	27	27	30	31	31
2σ	10	12	13	13	9	16	13	17
Age in Hrs	0-6	7-12	13-18	19-24	31-36	57-64	81-88	97-108

These detailed descriptive data on blood pressures should facilitate the diagnosis of hypotension in the very premature infant.