252 ARTERIAL CHEMOREFLEX REGULATION OF FETAL HEART RATE (FHR) AND BLOOD PRESSURE. Joseph Itskovitz, Abraham Rudolph. Univ. Calif., C.V.R.I., San Francisco.

Acute studies of the role of aortic (AC) and carotid (CC) chemoreceptors in fetal circulatory regulation have been inconclusive. We measured heart rate (HR) and aortic pressure in 26 chronically instrumented fetal lambs (116-130 days) 2 to 5 days after surgery. Fourteen fetuses served as control, 7 had aortic and carotid (sinoaortic) denervation (SAD), and 5 had only carotid denervation. Acute hypoxia was produced for 20 sec by decreasing uterine blood flow by inflating a balloon in the maternal aorta. In the controls, hypoxia caused a 27% fall of HR (172±14 vs. 125±28 bpm, $p<0.001$) and an increase in aortic pressure (42.6±2.8 vs. 46.5±3.6 torr, $p<0.001$) that followed the bradycardia. SAD abolished the bradycardia and the hypertension after uterine blood flow reduction. We also injected cyanide (CN) into the fetal inferior vena cava (25-150 µg/kg, n=10) to stimulate the chemoreceptors. CN produced a 35% fall in HR and variable BP changes. CN did not affect HR or aortic pressure in the SAD fetuses, but with carotid denervation alone, bradycardia and hypertension still occurred. Thus, aortic and carotid chemoreceptors are active in utero and are responsible for the HR and blood pressure changes during acute fetal hypoxia.

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●252A EFFECTS OF HEMORRHAGE (H) ON DISTRIBUTION OF UMBILICAL VENOUS RETURN (UVR) AND O_2 DELIVERY IN FETAL LAMBS. Joseph Itskovitz, Boyd Goetzman, Abraham M. Rudolph. Univ. Calif., Cardiovasc. Res. Institute, San Francisco.

We have shown that umbilical venous (UV) blood and O_2 delivered through the ductus venosus (DV) is preferentially distributed to the heart and brain. This phenomenon is enhanced during hypoxia while umbilical venous return (UVR) is maintained. We have now examined the effects of reducing UVR by hemorrhage (22.6±1.9% of fetal blood volume) in 8 chronically catheterized fetal lambs (122-128 d gestation). UVR and its distribution was measured by the microsphere method and O_2 delivery was calculated from DV derived blood flow and UV O_2 content. The following data were obtained:

	QUV	UVO_2 Cont.	O_2 Delivery	Q DV	
	ml/min/kg	ml/dl	ml/min/kg	ml/min/kg	%UVR
CONT	249	11.0	26.8	138	58.1
	±17	±0.6	±0.8	±19	±6.0
H	184*	10.2†	18.6*	124	67.4†
	±14	±0.5	±1.2	±12	±6.7

*p 0.001, †p 0.05, values are x + SE

In addition, UV derived blood flow and O_2 delivery to the brain, heart, placenta, and kidneys were maintained despite the observed changes in UVR and O_2 delivery, but that to the liver, carcass, lungs, and gut decreased following H. We conclude that fetal adjustment to H is accomplished by increasing the amount of UVR and O_2 that bypassed the liver through the DV. The DV blood flow is further redistributed to maintain UV derived blood flow and O_2 delivery to vital organs at the expense of other organs.

253 RESPONSE TO RAPID VOLUME EXPANSION DURING THE POSTNATAL PERIOD. Stanley James, Salha Daniel, and José Strauss. Depts. of Pediatrics and Anesthesia, College of Physicians and Surgeons, Columbia Univ., New York, N.Y.; Dept. of Pediatrics, Univ. of Miami Sch. of Med., Miami, Florida.

This study was designed to test the hypothesis that the postnatal diuresis observed in healthy neonates during the second hour of life is due to an expansion of their extracellular volume (ECV) as a result of manual or spontaneous placental blood transfusion (Strauss, J., Daniel, S., and James, L.S., Pediatrics, In Press). Seven healthy infants were infused with isotonic glucose during the third or fourth hour of life. Plasma and urine were analyzed for osmolality, inulin and para-amino hippuric acid in order to estimate osmolal and free water clearances as well as glomerular filtration rate (GFR) and renal plasma flow (RPF). Despite individual variation in initial values and in response, glucose infusion caused a prompt diuresis which was accompanied by an increase in GFR and RPF but no consistent change in urine osmolality. The response was of short duration and the fraction of exogenous load excreted was less than 5% in five out of 7 infants. This study indicates that during the first few hours of postnatal life, the kidney of the newborn infant is capable of responding to water load as that of the older newborn. It can also be concluded that the transient postnatal diuresis observed in these infants could be partly due to the expansion of ECV by placental blood transfusion.

254 CORRELATIONS OF GROWTH(G), LUNG PHOSPHATIDYLCHOLINE (PC), AND LUNG PROTEIN(PR) IN NEWBORN RABBITS. Alan H. Jobe, Machiko Ikegami and Harris C. Jacobs, UCLA School of Medicine, Harbor-UCLA Medical Center, Department of Pediatrics, Torrance.

Upon delivery, surfactant is released into the airway of newborn animals. However, changes in total lung (TL), alveolar wash (AW), and lung parenchyma (LP) PC, saturated PC (SPC), and LP PR have not been correlated with early neonatal G. We sacrificed 5 newborn rabbits per day taken from different healthy litters on days 1-12 of life. Following a standardized lung wash we measured in duplicate LP and AW PC, SPC and PR. Samples for the PC and SPC measurements contained ^{14}C-SPC to correct for losses in processing. The rabbits grew from 53±3 g to 240±20 g in 12 days (G curve: $Y=51e^{0.1315t}$, $r=0.986$). TL PC increased from 13±1 µmoles to 34±4 µmoles by 12 days (PC curve: $Y=11 + 3.87t - 0.16t^2$, $r=.958$). AW PC increased for only about 4 days, then the majority of the increase in TL PC was due to an increase in the LP pool. The LP PR increased from 78.2±2.9 to 194±23 mg by 12 days (PR curve: $Y=84.8 - 9.2t + 3.8t^2 - 0.2t^3$, $r=0.984$). The curves for increases in G, PC, and PR are complex and nonlinear. However, for example, expressing AW PC and LP PC relative to weight results in linear curves ($r=0.846$ and $r=0.930$, respectively) that "hide" time dependent nonlinear changes in the pool sizes. However, SPC/PC in LP (0.340±0.003) and SPC/PC in AW (0.612±0.009) were invariant. While there are complex changes in pool sizes of protein and phosphatidylcholine relative to growth, the ratios of LP and AW SPC to PC are tightly regulated.

255 PRENATAL METHADONE EXPOSURE: FACTORS AFFECTING SEVERITY OF WITHDRAWAL, Helen L. Johnson and Tove S. Rosen, Spon. by L. Stanley James, Columbia University College of Physicians and Surgeons, Dept. of Pediatrics, New York

There is conflicting evidence in the literature concerning the relation between maternal methadone dose during pregnancy and the severity of the withdrawal reaction experienced by the newborn. As part of an ongoing longitudinal study of children born to methadone-maintained mothers, 38 children exposed to methadone in utero were observed and their withdrawal evaluated and coded on a scale of one(mild) to 3(severe) by a trained observer. The relation between severity of withdrawal and the maternal methadone dose(MMD) prior to delivery was not significant. The relation between birth weight (BW) and severity of withdrawal was also not significant.

	MMD(mg)	BW(gm)	Male	Female
MILD	$\bar{x}$=39.32	$\bar{x}$=2999.09	8	10
MODERATE-SEVERE	$\bar{x}$=44.00	$\bar{x}$=2813.67	15	5

The data indicated clear sex differences in severity of withdrawal (see above Table), with significantly more males having moderate to severe withdrawal reactions than females ($x^2=3.69$, $p<.07$). This finding confirms developmental data indicating that males are more vulnerable than females to adverse environmental factors.

● 256 HYPOXIC HYPOXIA (HH) AND CEREBRAL O_2 DELIVERY IN THE FETAL AND NEWBORN SHEEP. M. Douglas Jones, Jr., Adam A. Rosenberg, Raymond Koehler, Richard J. Traystman, Michael A. Simmons, and Richard A. Molteni. Departments of Pediatrics and Anesthesia/Critical Care Medicine, The Johns Hopkins University School of Medicine, Baltimore, Maryland.

The effects of HH on cerebral O_2 delivery and on the ratio between O_2 delivery and cerebral O_2 consumption, i.e. the cerebral fractional O_2 extraction, has been studied in 20 unanesthetized fetal sheep in utero and 7 newborn lambs. Cerebral O_2 delivery was calculated as the product of cerebral blood flow (CBF), measured with the radioactive microsphere technique, and arterial O_2 content (CaO_2). Fetuses were studied as PO_2 varied from 12 to 35mmHg; lambs, as PaO_2 varied from 30 to 150mmHg. All data were corrected to a constant arterial PCO_2. Neither cerebral O_2 delivery nor fractional O_2 extraction varied with PaO_2 (unless hypoxia was extreme) in either fetuses or lambs, despite wide differences in their physiologic circumstances. This suggests that the regulated variable during HH is (CBFX CaO_2), not CBF. Since PaO_2 and CaO_2 are not linearly related, CBF must respond to changes in CaO_2 rather than PaO_2. This indicates regulation of cerebral blood flow at the tissue level. Cerebral fractional O_2 extraction is relatively constant between fetuses and lambs despite considerable differences in cerebral O_2 consumption and delivery. Thus, the most important determinant of cerebral O_2 delivery is not developmental stage, but O_2 need.