† 1831

VASCULAR-PULMONARY DYSPLASIA (VPD) ASSOCIATED WITH NEONATAL RAT HYPEROXIA. Stanley G. Shaffer, Donald W. Thibeault, Diane H. O'Neill, Frederick K. Hall, Sandra K. Bowen. University of Missouri at Kansas City School of Medicine, Children's Mercy Hospital, Kansas City, Missouri. The chronic sequelae of neonatal hyperoxia was studied in male rats exposed to 100% O₂ for the first 8 days of life. Dams were rotated between 41 oxygen treated (O₂) rats and 29 room air controls. Following O₂, rats had standard care until 60 days of age. Survival rate was 97%. Body weights at 60 days were similar. In vivo right ventricular pressure was measured percutaneously under anesthesia and was increased in the O₂ group (30.5 ± 4.3 vs 22.7 ± 3.3 mm Hg p <.0005). Hearts and lungs were excised at 63 days. Organ weights were similar between groups, however, right to left ventricular weight ratios were increased in the O₂ group (.316 ± .028 vs .259 ± .022 p <.0005). Air pressure-volume curves were similar but in the O₂ rats fluid deflation curves were shifted left and maximum fluid lung volumes were greater (14.05 ± 1.25 vs 12.03 ± .71 ml p <.0006). Pulmonary arteries were perfused at 100 cm H₂O with a barium-gel mixture and lungs fixed at 25 cm H₂O with formalin. Morphometric studies showed that the O₂ rats had an increased volume proportion of parenchyma (.865 ± .014 vs .820 ± 2.8 p <.05), increased mean linear intercept (111.5 μ ± 17.6 vs 75.3 μ ± 4.7 p <.0005), decreased alveoli and ducts per mm² (78.4 ± 5.2 vs 127.9 ± 8.4 p <.0005) and fewer small arteries (20-200 μ) per mm² (2.9 ± .41 vs .43 ± .57 p <.0005). The number of small arteries/100 alveoli were similar. We conclude that neonatal hyperoxia is associated with VPD as indicated by a decrease in the number of arteries, cor pulmonale and emphysematous changes in the air spaces.

1832

THE EFFECTS OF INHALATIONAL ANESTHETICS AND QUINACRINE ON ARACHIDONIC ACID-INDUCED PULMONARY VASOCONSTRICTION. Jay R. Shavevitz, Richard J. Travstman, Gail H. Gurtner (Spon. by Mark C. Rogers). The Johns Hopkins Medical School, The Johns Hopkins Medical Institutions, Departments of Anesthesiology/Critical Care Medicine, and Medicine, Baltimore. Using the isolated perfused rabbit lung, we have shown that anesthetic agents augment pulmonary vasoconstriction (dPpa) in response to L-butyl-hydroperoxide by generating thromboxane A₂ (TxA₂). Quinacrine (Q) has been described as an inhibitor of phospholipase A₂ (PLA₂). Arachidonic acid (AA) also causes dPpa and bypasses the PLA₂-mediated step in eicosanoid metabolism. AA-stimulated pressor response should not be augmented in the presence of anesthetic agents and should not be inhibited by Q. We tested these hypotheses in 5 isolated rabbit lungs perfused in a non-recirculating manner with Krebs-Henseleit (KH) solution. AA, 10-20 ug, was delivered into the inflow tubing over 1 min. The lungs were then ventilated with 2 MAC cyclopropane (C₃H₆) for 10 min and rechallenge with AA. Perfusion was begun with Q at 0.1mM (pH adjusted to 7.35-7.45) and a third AA challenge was delivered. C₃H₆ was discontinued, the lungs ventilated with air, and then given a fourth dose of AA. For air+AA, dPpa=20.8±10.9 (mean±SD); for C₃H₆+AA, dPpa=30.5±17.8; for air+Q+AA, dPpa=2.3±2.4; for C₃H₆+Q+AA, dPpa=30.5±5.2 torr. By 1-way ANOVA the effects of C₃H₆ and Q were significant (P<.001). By the Newman-Keuls test, C₃H₆ did not have a significant effect on dPpa after AA, but Q inhibited the response to AA with and without C₃H₆ (P<.05). Thus Q is not a specific PLA₂ inhibitor in our model.

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QUINACRINE INHIBITS ARACHIDONIC-ACID INDUCED PULMONARY VASOCONSTRICTION. Jay R. Shavevitz, Richard J. Travstman, and Gail H. Gurtner (spon. by Mark C. Rogers). The Johns Hopkins Medical School, The Johns Hopkins Medical Institutions, Departments of Anesthesiology/Critical Care Medicine, and Medicine, Baltimore. Quinacrine (Q) has been described as an inhibitor of phospholipase A₂ (PLA₂). We have used quinacrine to inhibit arachidonic acid (AA)-induced pulmonary vasoconstriction in the isolated perfused rabbit lung. The lungs of five New Zealand White rabbits were isolated and perfused in a non-recirculating manner *in situ* with Krebs-Henseleit (KH) solution. AA was delivered into the inflow tubing at a dose of either 10 or 20 ug, depending on which dose produced a pulmonary vasopressor response (dPpa) of 10 torr or greater over baseline. The lungs were then perfused with Q-containing KH solution at a concentration of 0.1mM (pH adjusted to 7.35-7.45) and rechallenge with arachidonic acid. Q was then washed out with plain KH solution for approximately 20 min and the lungs were bolused with a third dose of AA. Before Q perfusion dPpa=12.7±4.4 (mean±SD); after Q, dPpa=2.7±2; and after washout dPpa=10.2±6.5 torr. By 2-way ANOVA the effect of quinacrine was significant at P=0.002. By Least Significant Difference the pre-quinacrine and post-washout values for dPpa are not different. In our model, therefore, quinacrine is not a selective inhibitor of PLA₂, and the inhibitory effect is reversible. These results suggest that quinacrine is an inhibitor of the smooth muscle contractile response, by acting as a calcium channel blocker or as a calmodulin inhibitor.

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ANESTHETIC AGENTS DECREASE PULMONARY VASCULAR FLUID FLUX AFTER OXIDANT CHALLENGE. Jay R. Shavevitz, Richard J. Travstman, Gail H. Gurtner (Spon. by Mark C. Rogers). The Johns Hopkins Medical Institutions, Departments of Anesthesiology/Critical Care Medicine, and Medicine, Baltimore. In the isolated perfused rabbit lung *tert*-butyl-hydroperoxide (t-bu-OOH) produces a pulmonary vasopressor response by generating thromboxane A₂ (TxA₂). Inhalation anesthetics augment both the pressor response to t-bu-OOH and the production of TxA₂. We investigated the effect of cyclopropane (C₃H₆) on lung fluid flux in isolated rabbit lungs perfused with Krebs-Henseleit (KH) solution with recirculation. We continuously recorded pulmonary artery pressure (Ppa) and left atrial reservoir weight (dw). Ten preparations were given 2 t-bu-OOH challenges of 200 μM over 1 min while being ventilated with air, separated by 10 min, followed by ventilation serially with C₃H₆ at 0.5 and 2MAC each for 10 min with 200μM t-bu-OOH challenges at each anesthetic dose separated by 10 min. Four preparations, used as controls, were treated similarly, but were ventilated only with air. Results are below, expressed as flux in mL·min⁻¹:

Challenge	1	2	3	4
CONTROL (mean±SD)	0.13±.12	0.13±.06	0.20±.12	0.46±.50
C ₃ H ₆ (mean±SD)	0.19±.12	0.21±.10	0.01±.16	0.04±.14

By 2-way ANOVA and Least Significant Difference, fluxes with both doses of C₃H₆ are significantly less (P<.02) than flux with air ventilation alone. This study demonstrates that, although anesthetics augment eicosanoid production after oxidant challenge in the isolated lung, they decrease fluid flux. Cyclooxygenase products thus contribute little to lung fluid leak.

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HYPEROXIA AND PHAGOCYTIC FUNCTION IN NEONATAL LUNG. Michael P. Sherman (Spon. by C.T. Barrett) UCLA Medical Center, Dept. of Pediatrics, Los Angeles. Hyperoxia and its effects on lung phagocyte function were tested by exposing rabbits to a FiO₂-0.95+ or 0.21 for 2, 4, and 7 days after birth. *In vitro* oxidative metabolism of lung phagocytes, obtained by lavage, was studied by polarographic measurement of O₂ consumption±1mM cyanide. *In vivo* pulmonary clearance was ascertained by comparing the numbers of viable *Staphylococcus aureus* in the left lung at 0 and 6 hours after aerosol infection, and bacterial ingestion was measured by histologic examination of the right lung. Lavage effluents contained >94% alveolar macrophages (AM) through 4 days of exposure. After 7 days, the mean number of granulocytes in lavages of O₂-exposed animals rose to 77% and the group's cumulative mortality increased to 20% vs 4% in control litters. The mean clearance of *S. aureus* by control was 63, 60, and 72% at 2, 4, and 7 days vs O₂-exposed newborns which killed 64, 19 and 26% of the inhaled bacteria at those ages (p<0.02 O₂ vs control at 4 days). Impaired killing was not due solely to decreased ingestion because the mean numbers of intracellular bacteria exceeded 60% at 6 hr after infection in every O₂ and control group. At 4 days, O₂-exposed AM had lower basal and stimulated mitochondrial O₂ consumption (0.8±0.2 and 1.6±0.3 nmol O₂ consumed/10⁶AM/min, x±SEM, n = 6) vs control AM (1.7±0.2 and 2.9±0.3, n = 6, p<.02). Hyperoxia alters phagocytic killing of inhaled *S. aureus* by neonatal AM and is associated with diminished mitochondrial O₂ consumption. Granulocytes become a secondary lung defense after hyperoxia induces bactericidal dysfunction in the newborn AM.

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FREE WATER CLEARANCE DURING STATUS ASTHMATICUS (SA). Rosalyn Singleton, Donald I. Muel, and Richard A. Cohn (spon. by L. Pachman). Northwestern University Medical School, Children's Memorial Hospital, Department of Pediatrics, Chicago, Illinois. Patients in SA often have elevated plasma antidiuretic hormone levels. To determine if children in SA have impaired water excretion and increased risk of developing hyponatremia when given a fluid challenge (FC), 5 consecutive patients with moderate asthmatic symptoms after 2 doses of epinephrine were given 20 ml/kg of D₅ 0.2% N.S. i.v. over 30 minutes. Urine was collected at 20 minute intervals for free water clearance (CH₂O). This protocol was repeated 24-48 hours later after clinical improvement (CI). Values of serum Na (S_{Na}, mEq/L), serum osmolality (S_{osm}, mOsm/kg H₂O), minimal urine osmolality (min U_{osm}, mOsm/kg H₂O), and CH₂O (ml/min) after acute FC in patients during SA and after CI; (Δ) = change in S_{Na} or S_{osm} after FC. *p<.05, SA vs CI for paired data.

PT.	AGE	S _{Na}		S _{osm}		MINIMAL U _{osm}		CH ₂ O	
		SA	CI	SA	CI	SA	CI	SA	CI
1	15	145(+6)	141(-4)	268(-4)	300(-24)	123	89	5.4	13.0
2	10	134(-4)	133(+3)	275(+2)	266(+2)	62	86	8.5	9.3
3	7	131(-5)	135(+4)	274(-4)	277(+3)	156	66	1.0	11.4
4	5	134(-4)	136(+3)	259(-13)	255(+1)	43	2	2.5	6.3
5	9	131(-4)	134(+2)	258(-12)	259(+1)	55	39	3.8	6.3

There was no difference in S_{Na} or S_{osm} after FC during SA vs after CI; 4/5 patients in SA had lower S_{Na} and S_{osm} after FC and 4/5 after CI had higher S_{Na} and S_{osm} after FC. Minimal U_{osm} achieved after FC tended to be lower after CI but the differences were not significant. However, CH₂O was significantly lower during SA vs CI. Despite the small risk of hyponatremia, pediatricians infusing hypotonic fluids to children in SA should be aware of temporary impaired water excretion.