

†1783 DEFICIENT ALVEOLAR MACROPHAGE (AM) FUNCTION AND NEUTROPHIL (PMN) MOVEMENT INTO THE NEONATAL PRIMATE LUNG. Geoffrey Kurland, Anthony TW Cheung, Michael E. Miller, and Erin Walsh. University of California Davis Medical Center, Department of Pediatrics, Sacramento.

Deficient defense mechanisms are felt to be important in neonatal pneumonia. Using serial bronchoalveolar lavage (BAL) with Dulbecco's phosphate buffered saline through balloon-tipped catheters we have studied both AM function and the neonatal pulmonary PMN response. In healthy adult monkeys, the alveolar macrophage (AM) is the predominant cell type isolated from a single BAL. Repeat BAL in 24 hours results in a marked increase in PMNs in the BAL fluid. We found AM from BAL in Rhesus neonates (<7 d of age) were deficient in phagocytosis, bacterial killing and chemotaxis. We also compared the appearance of PMNs recovered from serial BAL in neonatal (Ne), infant (In), and adult (Ad) Rhesus:

Age	Ne (<6d)	Ne (6-10d)	In (1-8 mos)	Ad (>3 yr)
n	5	5	12	21
BAL day 1				
% AM	92±4	89±3	91±3	90±5
% PMN	3±3	8±6	7±3	4±4
BAL day 2				
% AM	91±4	78±6	73±5	48±8
% PMN	4±1	20±3	24±6	49±8

Compared with adults, newborns (<6d) have a decreased pulmonary PMN response ($p < .001$) and older infants (6d-8 mos) have an intermediate response. This compromise in pulmonary PMN influx and deficient AM function may have direct clinical relevance to the susceptibility and response of neonates to bacterial pneumonia.

1784 MOVEMENT DISTURBANCES OF INFANTS WITH BRONCHOPULMONARY DYSPLASIA (BPD). Jeanene M. Laegreid, Cheryl D. Lew, Joan M. Walker, (Spon. by Thomas G. Keens), Univ. So. Calif., Childrens Hosp. of Los Angeles, Dept. of Phys. Therapy, Neonat. & Ped. Pulmonary Div., Los Angeles.

Infants with BPD frequently have patterns of shoulder girdle retraction and cervical hyperextension which may interfere with midline movement. Therefore we compared arm movement, head control, and cardiorespiratory changes in response to movement and handling in 10 infants with BPD at 16 weeks corrected age to that of 11 normal age-matched infants. Arm responses to midline stimuli, retention of primary reflexes, scapular and cervical muscle tone in supine and prone were scored based on direct observation and analysis of videotape recordings. The mean weight of the BPD infants was 78% of that of the controls (BPD=4925±739g vs 6278±31g; M±SD, $p < 0.001$). The BPD infants had respiratory rates 35% higher than the controls (mean=48 vs 35.5, $p < 0.05$). No significant changes occurred in heart rate, respiratory rate or $TcPO_2$, indicating both groups tolerated the procedure equally well. Arm midline activity of the control infants was 2-fold greater than that of the BPD group ($p < 0.05$). Prone head control and trunk support were developed twice as well in the controls than BPD infants ($p < 0.05$). Significant retention of the spontaneous asymmetrical tonic neck reflex and grasp reflex observed in the BPD infants was not present in the controls ($p < 0.05$). Muscle tone was similar in both groups. We speculate that BPD infants may curb movement in order to reserve energy for increased work of breathing.

1785 EVALUATION OF INHALATION AIDS OF METERED DOSE INHALERS IN ASTHMATIC CHILDREN. Haesoon Lee, Interfaith Medical Center, SUNY/Downstate Medical Center, Brooklyn, New York. (Introduced by Hugh E. Evans).

Many patients have incorrect aerosol inhalation technique with metered dose inhalers (MDI) and fail to benefit fully from this form of therapy. Several inhalation aids have been developed and marketed recently for those cases. However such aids may benefit even those with proper technique. We compared bronchodilator efficacy of 2 puffs of albuterol aerosol administered either directly from a MDI or from an Inspirease (Key Pharm, Miami, Fla), an Aerochamber (Monaghan, Plattsburgh, NY), or our own Aerosol Bag (Pediatrics 1984) in 20 patients with stable asthma aged 8-15. All had been instructed in inhalation technique in the past and were receiving beta agonists from MDI. They were taught the use of the 3 inhalation aids and were studied with a double blind, randomized cross-over protocol in 4 days. After the baseline pulmonary function was tested the patient inhaled 2 puffs of aerosol from each of two of 4 modalities each day. One contained albuterol and the other placebo. The patient inhaled from a MDI unsupervised but was supervised by the examiner with the 3 inhalation aids. FEV₁ increased similarly after all 4 modes of administration at 15, 30, 60, 120 and 180 minutes (maximum increases at 60 minutes were 33, 33, 34, 39% over the baseline for MDI, Inspirease, Aerochamber and aerosol bag). Six patients who had suboptimal inhalation technique benefitted from 3 aids equally. Those with proper technique did not benefit from any of the inhalation aids. The 3 new inhalation aids are helpful to those with difficulties in using MDI.

1786 OBJECTIVE ASSESSMENT OF ORAL METAPROTERENOL SULFATE SYRUP (MS) IN YOUNG ASTHMATICS. Eliezer Nussbaum, Stanley P. Galant. Children's Lung Center, Miller Children's Hospital and The Department of Pediatrics, University of California, Irvine.

The efficacy of three different single doses of MS (0.4 mg/kg, 0.6 mg/kg, 0.8 mg/kg) was studied in 20 asthmatic children, 2 - 6 years of age, in a double blind, randomized, four-period cross-over fashion and compared to placebo (p). Between treatment comparison of mean changes from baseline in total respiratory conductance (TRC) by modified forced oscillation method showed that MS in all 3 doses was significantly more effective as a bronchodilator than placebo ($p < 0.05$) for at least 4 hours. Maximal response was achieved with 0.6 mg/kg and a peak was evident for all 3 doses at 30-60 minutes after which time a dose response curve could not be constructed. MS at 0.8 mg/kg did not result in greater TRC when compared to 0.6 mg/kg ($p > 0.05$). Tachycardia and tremor was observed in 48% and 24% of children respectively and was proportionally dose dependent. We conclude that MS exerts its bronchodilator effect in asthmatic children <6 years for at least 4 hours with a peak at 30' - 60' and that a maximal response was achieved with 0.6 mg/kg.

REFERENCES: Nussbaum E, Galant SP: Measurement of Total Respiratory Resistance in Children by a Modified Forced Oscillation Method. *Pediatr Research* 18:139, 1984.

1787 AEROSOL INHALATION TEACHING DEVICE. Hae Soon Lee, Interfaith Medical Center, SUNY/Downstate Medical Center, Brooklyn, New York. (Intro. by H.E. Evans).

Aerosol administration of beta agonists is generally considered the most effective route to achieve bronchodilation in asthma. Canister nebulizers of beta agonists are widely used but many patients fail to learn the proper aerosol inhalation technique and hence do not benefit from it.

We have developed an aerosol inhalation teaching aid (TA) by modifying the jacket of a metered dose inhaler (MDI). A horn was inserted on the jacket so that inhalation was accompanied by a horn sound. In addition a flash light was adapted to the jacket so that it was turned on when the canister was actuated. By responding to the sound and the light the patient learned the technique.

We evaluated this device (TA) in 34 patients with asthma aged 7-16 who had either never used a canister nebulizer in the past (14 patients) or whose technique was incorrect (20 patients). The technique was explained verbally and then demonstrated with placebo MDI (VI) for 10 minutes. Eleven of 34 learned it within 10 minutes. The 23 who had failed to learn it with VI were taught with a TA and all 23 were then able to learn it within 10 minutes. On re-examination 1 week to 1 month later 2 in the VI group and 6 in the TA group still showed incorrect technique. All 8 of them re-learned with second instruction and had retained this technique when tested subsequently. TA is a useful device for teaching the inhalation technique to those who have difficulty learning it with VI alone.

1788 QUANTITATIVE ASSESSMENT OF VENTILATION INDUCED PULMONARY EPITHELIAL INJURY IN THE NEWBORN PIGLET. R.M.K.W. Lee, L. Adams, H.O. Brodovich. (Spon. by J. Sinclair) Depts. of Pediatrics and Anesthesia, McMaster Univ., Hamilton, Ontario, Canada, L8N 3Z5.

To better understand the airway damage that occurs in BPD we performed the following study to establish and quantitate a model of sub-lethal airway injury in a newborn animal. Six piglets less than 2 days old were anaesthetized, intubated, and ventilated with dry pure oxygen for 2 hours with a pressure limited time cycled ventilator. Lungs were fixed by instillation at 50 cmH₂O pressure. Four un-intubated piglets served as controls (C). Light and electron microscopy demonstrated 2 types of epithelial damage in the ventilated piglets (V). Injury was quantitated in the trachea and first 4 bronchial divisions. Type I damage, presumably from mechanical trauma, consisted of denudation of the epithelium down to the basement membrane and was only seen in the trachea. Type II damage, presumably from desiccation, consisted of ciliary damage or disorganization and was seen from the trachea to the 4th bronchial division. Results are % of cross section surface area.

	Normal		Type I injury		Type II injury	
	V	C	V	C	V	C
Trachea	34%	97%	35%	0%	42%	3%
Bronchi (1-4)	42%	86%	4%	0%	56%	14%

We conclude that significant morphologic damage of airway epithelium is induced by 2 hours of ventilation with dry oxygen in the newborn piglet. (Supported by Physicians' Services Incorporated Foundation, Toronto, Ontario).