

1804 CHRONIC OBSTRUCTION OF PERIPHERAL AIRWAYS AND HYPOXEMIA IN ASTHMATIC CHILDREN. Jose Velasquez Rojas and Anthony L. Mansell, Columbia University College of Physicians & Surgeons, Babies Hospital, New York.

Both in vivo and in excised lungs, the nitrogen washout alveolar plateau (phase 3 slope) correlates with histopathologically detected obstruction of peripheral airways. We hypothesized that children with abnormally steep phase 3 slopes between episodes of asthma should exhibit both hypoxemia and relatively severe clinical courses because of chronic obstruction of peripheral airways. To test this, we measured phase 3 slope and supine arterial oxygen saturation (SaO_2 , by ear oximetry) and reviewed the clinical histories of 25 children in stable condition between episodes of wheezing. We found that the 7 children with abnormally steep phase 3 slopes also had the lowest values for SaO_2 (mean 93.7 ± 1.4 SD %). Phase 3 slope had a significant negative correlation with SaO_2 . There was no correlation between SaO_2 and expiratory flow rate, density dependence of expiratory flow or the ratio of residual volume to total lung capacity. During the year preceding the study, outpatient visits resulting in injections of adrenaline were significantly more frequent in the 7 children with steep phase 3 slopes than in the 18 with normal phase 3 slopes ($P < .05$). We conclude 1) groups of asthmatic children with and without persistent obstruction of peripheral airways can be identified by the single breath nitrogen washout and 2) those children with persistent obstruction of peripheral airways tend to be hypoxemic and have a relatively high incidence of status asthmaticus.

†1805 AROUSAL (AR), APNEA AND SIGHING FOLLOWING LARYNGEAL STIMULATION (LS) IN SLEEPING TERM NEWBORN LAMBS. F. MARCHAL, J.P. CRANCE, P. VERT, Department of Physiology and of Neonatology, University of NANCY - FRANCE.

A sigh frequently occurs following LS induced apnea. It has been shown that AR improves the respiratory recovery from such apnea in sleeping premature newborn lambs. This study was designed to evaluate the relationship between AR, apnea duration (AD) and incidence of sigh following LS in 4 unanesthetized term newborn lambs chronically instrumented with a tracheostomy, EEG and EMG electrodes. LS was performed by a retrograde infusion of 1 ml distilled water onto the larynx for 5 sec. during quiet (QS) and active sleep (AS). Apnea was measured from the onset of stimulation to the first breath thereafter. AR was timed from the EMG signal. The 10 sec. period following apnea cessation (recovery period) was examined for the presence of a sigh. 23 studies were obtained during QS and 46 during AS. AD was similar in QS ($13.1 \text{ s} \pm 1.9^*$) and in AS ($13.3 \text{ s} \pm 2.3^*$). AR was delayed during AS ($18.1 \text{ s} \pm 4.5^*$) as compared with QS ($6.5 \text{ s} \pm 1.9^*$, $p < 0.02$). During QS, AR had occurred in all studies before the 10th second following apnea cessation but had not occurred in 7 studies during AS. In both sleep states the occurrence of a sigh during the recovery period was always preceded by AR. During AS without AR, AD was not longer but the incidence of sigh was significantly lower (0/7) than during QS (17/23, $p < 0.01$) or AS with AR (31/39, $p < 0.001$).

It is concluded that in term newborn lambs: AR to LS induced apnea is depressed during AS and sighing is associated with AR in the recovery period. Apnea offset is less dependent on AR during AS than during QS. * Mean \pm SEM.

1806 UNIQUE FEATURES OF HYPERSENSITIVITY PNEUMONITIS IN CHILDREN. Susan G. Marshall, William E. Pierson, Gail G. Shapiro, Clifton T. Furukawa, Susannah B. Walker, C. Warren Bierman.

Five cases of hypersensitivity pneumonitis from doves and/or pigeons in children presented within a 8 month period. Patients were 11 to 15 years of age; there were 2 females and 3 males. The diagnosis in all patients was confirmed by the presence of precipitating antibody to dove or pigeon serum and/or droppings. Clinical improvement was noted in all patients after exposure to the birds ceased.

Although hypersensitivity pneumonitis is generally considered to occur primarily in non-atopic individuals, 3 of our 5 patients had histories suggestive of atopy.

While HP can occur as an acute, intermittent systemic and respiratory illness, all of these patients developed insidious and progressive respiratory disease; 3 had profound weight loss.

The children were followed for up to 3 years after initial diagnosis, with interval history, physical exam, serum precipitins, nasal smears, skin tests, pulmonary function studies and methacholine challenges.

On follow-up evaluations, 4 out of 5 patients had continuing respiratory disease and 1 had bronchial hyperreactivity with a strongly positive methacholine test. One of the patients continues to have precipitating antibody to avian antigen 3 years after termination of exposure.

Early identification of HP is important to avoid the development of chronic pulmonary disease with progressive pulmonary fibrosis.

1807 APNEA INDUCED BY UPPER AIRWAY PRESSURE CHANGES DECREASES WITH MATURATION IN PUPPIES, Commen P. Mathew, John T. Fisher, Franca B. Sant'Ambrogio and Giuseppe Sant'Ambrogio (Spon. by David K. Rassin), U.T.M.B., Depts. of Pediatrics and Physiology & Biophysics, Galveston, Texas.

Upper airway pressure changes reflexly alter breathing pattern in adult rabbits (Mathew et al., *Respir. Physiol.* 49:223, 1982). Maturation effects of this reflex response was investigated in nine 1-14 day old and six 29-34 day old puppies anesthetized with chloralose-urethane and spontaneously breathing through a tracheostomy. Alterations in the breathing pattern occurred to a greater extent in the 1-14 day old puppies; collapsing pressure was more effective than distending pressure. In 1-14 day old puppies negative pressure caused apnea in 11.6% of the trials. When apnea did not occur a significant prolongation of expiratory (Te) and inspiratory (Ti) durations and a reduction in tidal volume (Vt) were found. In the 29-35 day old puppies apnea did not occur during any of the challenges and changes in Te, Ti and Vt were minimal. These results indicate the presence of strong inhibitory influences originating from the upper airway on respiration in the early stages of development. Since superior laryngeal afferents are known to mediate these reflex effects and laryngeal mechanoreceptors respond similarly to these stimuli in newborn and adult dogs (Sant'Ambrogio et al., and Fisher et al., *The Physiologist* 26:A-45 & A-39, 1983) the difference in reflex effects between the two age groups may be due to different integrative properties of the central nervous system during maturation. Supported by: March of Dimes #5-426, NIH HL-20122 and HL-01156.

†1808 NUTRITIVE VS. NON-NUTRITIVE SUCKING: EFFECTS ON BREATHING PATTERN OF TERM NEONATES. Hortencia G. Luna-Solorzano, Mark L. Clark, M. Dale Peterson and Commen P. Mathew (Spon. by David K. Rassin), Univ. of Texas Med. Br., Depts. of Pediatrics & Anesthesiology, Galveston, Tx.

Marked inhibition of breathing during the early part of oral feeding is documented in neonatal lambs and preterm infants. This is presumably due to stimuli arising from the upper airway due to presence of liquid or due to repetitive sucking and/or swallowing. Sucking generates negative pressure in the upper airway and negative pressure in the upper airway is known to decrease the breathing frequency. We monitored 12 term healthy newborns (1-3 days old) during non-nutritive and nutritive sucking polygraphically to determine the effect of feeding on the breathing pattern and to separate the effect of sucking per se. Heart rate, sucking pressures, nasal airflow and respiratory efforts were monitored in semi-upright position. During nutritive feeding an initial burst of continuous sucking lasting 20-30 sec. followed by intermittent sucking was seen. Decreased breathing frequency and tidal volume as well as shortening of inspiration were seen during the initial period. A recovery towards control values was seen during intermittent sucking. In contrast, changes in breathing pattern were minimal during non-nutritive sucking. We conclude that stimuli related to either the presence of liquid in the upper airway or repetitive swallowing rather than sucking per se appears to be responsible for the inhibition of breathing seen during oral feeding.

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1809 EFFECTS OF THEOPHYLLINE ON PNEUMOGRAM ABNORMALITIES IN INFANTS WITH VARYING CLINICAL PRESENTATIONS. K. McCulloch, E. Beaty, M. Rusnak, D. Vidyasagar, Department of Pediatrics, University of Illinois Hospital, Chicago.

Pneumograms before and after theophylline (T) were obtained in 48 infants who comprised 5 groups: 1) asymptomatic low birthweight infants (A-LBW, n=8); 2) LBW infants with symptomatic apnea (S-LBW, n=15); 3) infants with histories of "near-miss for sudden infant death syndrome (SIDS)" (S-NM, n=7); 4) full term infants with spells of apnea, bradycardia or cyanosis in the nursery (S-F, n=12); 5) asymptomatic infants with a family history of SIDS (A-FH, n=6). Initial pneumograms showed one or more of the following during sleep: 1) prolonged (>15 sec.) apnea; 2) % periodic breathing (PB) high for age; 3) # episodes PB/100 min. high for age; 4) time spent in apnea ≥ 6 sec. ($\text{Ag}/\text{D}\%$) high for age. Post-T pneumograms were obtained after at least 48 hrs. of therapy (peak serum level $\bar{x} \pm \text{SD} = 10.0 \pm 2.7$ mcg/ml). Comparisons were made by t test, paired t test and Chi square. S-LBW had the most abnormal pre-T pneumograms with % PB and # PB/100 min. significantly higher than in S-NM and S-F. Pneumograms improved in all patients after T with elimination of prolonged apnea in all but one ($p < 0.04$) and significant reductions in % PB, # PB/100 min. and $\text{Ag}/\text{D}\%$ ($p < 0.001$). S-LBW also had the most abnormal post-T pneumograms with # PB/100 min. and $\text{Ag}/\text{D}\%$ significantly higher ($p < 0.05$) than in A-LBW and S-NM. S-LBW pneumograms were significantly less likely to normalize after T than were those of A-LBW, S-NM and A-FH (40% vs 100%, $p < 0.05$ for each). Thus, T reduces pneumogram abnormalities in all infants, but the degree of improvement appears to depend on clinical factors such as prematurity and presence of symptoms.