CONTINUOUS NEGATIVE CHEST WALL PRESSURE (CNP) THERAPY IN OLDER CHILDREN. Shyamal K. Sanyal, Walter T. Hughes and Scott Harris, St. Jude Children's Research Hospital, Memphis, Tennessee.

CNP provides an effective means of improving arterial oxygenation in spontaneously breathing patients. To date, this has been used mainly in infants with severe respiratory distress syndrome. Our purpose is to describe the application of CNP in older children with diffuse bilateral alveolar disease.

An Emerson tank respirator was modified to apply continuous negative pressure of -5 to -18 cm H_2O to chest wall and lower parts of the body in 4 patients, 5 to 10 years of age with severe P. carinii pneumonitis (PCP). Each patient had respiratory rate >70 per minute, PaO_2 of <55 mm Hg breathing 50-60% of oxygen or higher and $PaCO_2$ <40 mm Hg. Within 24 hours of institution of CNP, arterial oxygen tension rose from pre-CNP mean of 42.7 ± 11.4 to 98.2 ± 26.9 mm Hg, respiratory rate decreased from 87.7 ± 15.8 to 68.2 ± 18.5 and FIO_2 from 60.25 ± 8.95 to 52.6 ± 7.3. In 2 patients in whom it was done, A-aDO_2 gradient decreased from 589 and 545 to 425 and 416 mm Hg, and right to left shunt from 28 and 27% to 22 and 24%, respectively. Two patients developed pneumothorax that was successfully decompressed. Both had received CNP >16 mm Hg. Of the 4 patients, 2 recovered completely after 6 and 15.5 days of CNP therapy. Remaining 2, after 96 hours of improvement, developed progressive hypoxia and died. This is in contrast to 100% mortality in 5 other patients with severe PCP who were treated with volume-controlled positive pressure respirator.

We conclude that CNP provides an effective means of improving arterial oxygenation in older children as well, reduces duration of exposure to high oxygen concentration and avoids use of endotracheal intubation.

INFANT SLEEP VENTILATION. Daniel C. Shannon, S. Allen Fagenholz, Kathleen C. O'Connell, Harvard Med. Sch., Massachusetts Gen. Hosp., Children's Service, Boston.

18 infants were studied during natural sleep with continuous polygraph recording of ventilation($\dot{V}_E$) by nasal pneumotachygraph, end tidal P_{CO_2} (P_{ACO_2}), EEG, EKG and oculogram (EOG). Sleep state was scored by patterns of EEG, EOG and respiration (and confirmed by observation). $\dot{V}_E$, f, V_T, P_{ACO_2} and ventilatory responses to 100% O_2 and to 5% CO_2 in air were determined in quiet (mean=62 min) and REM (33 min) periods.

12 infants (gest. age 49.2 wk) with unexplained cyanotic spells requiring resuscitation had quiet sleep apnea > 10 sec (2/Hr) and episodes of $\dot{V}_E$ < 50% mean (5 min/Hr); they had REM sleep apnea > 10 sec, (1.3/Hr) and $\dot{V}_E$ < 50% mean (3.4 min/Hr). Fall in $\dot{V}_E$ was due to fall in V_T to < 3ml/Kg. 6 unaffected infants (gest. age 47.3) had neither > 10 sec apnea nor fall in $\dot{V}_E$. The steady state response to CO_2 was less (30.6 ml/min/Kg/mm Hg) in affected compared to unaffected (39.5) infants in quiet sleep and 26.0 compared to 34.4 in REM sleep.

Infants with unexplained cyanotic spells demonstrated prolonged apnea and depressed $\dot{V}_E$ with abnormal CO_2 response in quiet and REM sleep suggesting inadequate integration of respiratory control mechanisms.

CARDIOVASCULAR RESPONSES TO CONTINUOUS POSITIVE PRESSURE BREATHING IN THE PIGLET. Margo M. Schleman, N. Gootman and Linda A. Crane. Long Island Jewish-Hillside Med. Ctr., Dept. of Ped., New Hyde Park, N.Y.

Continuous positive pressure breathing (CPPB) has recently been used in the management of Respiratory Distress Syndrome of the newborn. The healthy piglet was chosen as a model to study the effects of CPPB on heart rate (HR), mean arterial blood pressure (BP) and cardiac output (CO). Fourteen piglets, 3 to 24 days old, were lightly anesthetized with halothane or pentobarbitol and artificially ventilated with a mixture of O_2 and N_2O. The end-tidal pressure (ETP) was varied from 0 to 17 cm H_2O measured by an intratracheal catheter. CO was determined by dye dilution technique using cardiogreen. Arterial blood gases were measured at frequent intervals. The HR changes varied. BP decreased in each of 14 piglets when the ETP was raised to +3 cm H_2O. For an ETP of 10-17 cm H_2O there was a decrease in BP which varied from 6% to 63%. CO decreased in each of 9 animals in which CO was studied when the ETP was raised to +5 cm H_2O. For an ETP of 12-17 cm H_2O there was a decrease in CO which varied from 30% to 38%. There was a significant inverse relationship between BP and CO with respect to level of ETP. These results show that CPPB decreases BP and CO in piglets.

THE ROLE OF CYCLIC AMP IN LAMELLAR BODY SYNTHESIS & SECRETION Mildred T. Stahlman, Mary E. Gray, Sally Lieu and Frank Chytil Vanderbilt Med. Sch., Depts. of Ped, Path, & Biochem. Nashville, Tn.

To assess the effect of dibutryl cyclic 3'-5' adenosine monophosphate (DBcAMP) on some aspects of pulmonary Type II cell morphology and biochemistry, adult rats were injected i.p. with 47 mg/kg DBcAMP and sacrificed at intervals. Control rats received saline or 5' AMP. Lung tissue was prepared for electron microscopy. 5 min. postinjection, Type II cells in treated rats appeared more numerous than in controls and endoplasmic reticulum (ER) dilated. By 10 min. the cells appeared larger, lamellar bodies (LB) were increased per cell and ER remained dilated. Multivesicular bodies (MVB) appeared in increased numbers. By 15 min. the cells were swollen, often with loss of microvilli and MVB's conspicuous. There appeared to be fusion of LB limiting membranes with plasma membranes and extrusion of LB contents into alveoli. By 30 min. macrophages appeared in alveoli and septa. Type II cells were of more normal size and vacuoles appeared in the cytoplasm near the alveolar surface suggestive of endocytosis. By 60 min. Type II cells were not remarkable. Choline kinase (CK) activity was assayed in LB rich cell fractions from pooled lung of 6 DBcAMP treated and 6 control rats sacrificed at 15 min. There was a 5-fold increase in CK activity in the DBcAMP treated rats. These findings suggest that intracellular synthesis and extrusion of LB from Type II cells may be mediated by cAMP.

NEW COMPLICATION OF ASSISTED VENTILATION IN THE NEONATE: STRICTURE AFTER NASOTRACHEAL INTUBATION. Elsa J. Sell and Thomas R. Harris Intr. by Vincent A. Fulginiti. Univ. of Az., Coll. Med., Univ. Hosp., Dept. of Ped., Tucson.

The purpose of this paper is to report a potentially serious complication of nasotracheal intubation in the neonate, not previously reported. In our nurseries over the last 1½ years, 130 surviving infants received ventilatory support with a Bournes respirator and nasotracheal airway. Primary diagnosis was idiopathic respiratory distress syndrome (IRDS) in 98, meconium aspiration in 9, sepsis in 2, diaphragmatic hernia in 5, apnea in 3, post operative support in 13. Four infants developed unilateral nasal strictures. All weighed less than 1600 grams, were intubated in the first 4 days of life with 3.0 mm or 3.5 mm portex tubes, for duration of intubation 3,3,8 and 48 days respectively. Only one tube change was required and that in the 48 day baby. Etiology of the stricture is unknown. Three have been seen in follow up at 4 or 6 months; the involved nasal passageway was patent but very diminished in size. There have been no apparent problems associated with the strictures to date. These findings are particularly important to those using any form of ventilatory support involving both nares because development of bilateral nasal strictures in infants who are obligate nose breathers could potentially be lethal.

VALUE OF AIR AND HELIUM-OXYGEN FLOW-VOLUME CURVES IN DETECTION OF EARLY SMALL AIRWAY DISEASE IN CYSTIC FIBROSIS (CF). Lynn M. Taussig, Michel Bureau, William W. Fox, Richard Martin, Pierre H. Beaudry, (Intr. by Keith N. Drummond) The Montreal Children's Hospital and the Meakins-Christie Laboratories, McGill University, Montreal, Canada.

To assess early small airway disease in CF patients with minimal pulmonary involvement, maximal expiratory flow volume (MEFV) curves were obtained while the children were breathing first air and then an 80% helium - 20% oxygen gas mixture. Fifteen CF patients and 24 normal children were studied. Maximal flow rates ($\dot{V}$max) at 50 and 25% vital capacity (VC) were calculated from the air and helium-mixture MEFV curves and compared to give flow ratios (helium $\dot{V}$max/air $\dot{V}$max) at these lung volumes. At 50% VC, the helium/air ratios were similar in CF patients and normal subjects. At 25% VC, the ratio was significantly lower ($p < 0.05$) in the CF patients. The air and helium MEFV curves from each subject were superimposed and the point where the curves crossed (point of identical flow-PIF) determined and expressed as % VC. For the CF patients, the mean PIF was 18.3% VC and for the controls, 4.9% VC ($p < .001$). Nine of the 15 CF patients had PIF values greater than 2 S.D. from the normal mean. None of the following tests were abnormal in more than 3 patients: FEV_1/FVC, MMEF, RV/TLC and $\dot{V}$max 25 and 50% TLC. Closing volumes were normal in all patients. Determination of the PIF appears to be a simple, noninvasive, and sensitive test for the detection of early small airway involvement in CF.