THE MEASUREMENT OF "FREE" SECRETORY PIECE IN SPUTUM.

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Free secretory piece (FSP) was measured immunologically in the sol phase of sputum from 37 patients with chronic obstructive bronchitis (16 during acute respiratory infection) and the results compared with the total secretory piece (SP; both bound to IgA as secretory IgA and that unbound) and 11S IgA content of the same samples.

Free secretory piece was found in every sample but the concentrations were higher in the infected samples (mean value = 115.3, SD ± 51.5% standard) than the non-infected samples (mean value = 79.5; SD ± 77.3% standard, $2p<0.01$). There was no correlation between the FSP and SP concentrations in the samples. However, when each sample was standardised for its 11S IgA content, there was a highly significant relationship ($2p<0.001$) between the FSP/11S IgA ratios and SP/11S IgA ratios ($r = 0.933$) suggesting that greater quantities of FSP are found when there is an immunological excess of total SP over 11S IgA. The inverse relationship between FSP and 11S IgA ($r = -0.6$; $2p<0.01$) suggests that the amount of FSP in any sample is partly dependant upon the amount of dimeric IgA present.

Comparisons of the FSP/11S IgA ratios in patients suggests that there may be defects of "local" IgA production whilst systemic production is normal and vice versa. The techniques described offer a method for studying the integrity of the "local" IgA system.

THE EFFECTS OF A VIRAL LARYNGOTRACHEITIS ON THE EPITHELIAL BARRIER OF CHICKEN AIRWAYS.

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The effects of a virus infection on the barrier function of tracheal epithelium were compared to the effects of a chemical agent (methacholine) which selectively increases membrane permeability and both were compared to controls. The disruption of the airway epithelium induced by the virus infection caused an increased permeation of horseradish peroxidase (HRP) through this barrier. Methacholine enhanced HRP uptake from the airway lumen to the blood as compared to controls. Visualization of HRP in the tracheal epithelium by transmission electron microscopy correlated with the radioimmunoassay measurements in the blood. Serial anti-HRP antibody titers were measured by a competitive binding technique. The antigen permeation induced by methacholine was associated with an enhanced anti-HRP antibody production. The larger increase in antigen permeation seen with the viral infection was associated with depressed anti-HRP titers. It was concluded that viral disruption of the airway epithelial barrier may contribute to an increased uptake of orally inhaled antigens. The relationship, however, between the increased antigen penetration consequent to the viral infection and the development of allergy remains unclear. This work was supported by Grant MA-4536 from the Medical Research Council of Canada. p. 14

PULMONARY FUNCTION PARAMETERS OF ASTHMATIC CHILDREN ON ORAL METAPROTERENOL VERSUS THEOPHYLLINE.

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Oral theophylline (T) is often the first drug of choice for treatment of asthma, but side effects, poor taste and blood level monitoring are disadvantages. To determine if oral metaproterenol (M) has comparable control of pulmonary function parameters, 20 asthmatic children were studied in a randomized, double-blind, crossover protocol. A minimum 2 week titration period for theophylline served as a wash-out period where no beta adrenergic drugs were allowed. Children then received either active M (dose of 10-20 mg based on weight) and placebo T or placebo M and active T on a t.i.d. basis for 4 weeks. Then they received the opposite combination. Pulmonary function testing at baseline, ½, 1, 2, 3, and 4 hours after dosing was done at the end of the 1st and 4th weeks of therapy. Results are below:

	Highest FEV_1				Highest FMF			
	Week 1		Week 4		Week 1		Week 4	
	Peak	Mean	Peak	Mean	Peak	Mean	Peak	Mean
M	10	11	10	8	12	9	9	10
T	7	9	10	12	8	11	11	10

Three cases had identical peak FEV_1 at week 1.

	Total Cases With Comparable or Better Results			
	FEV_1 (Range of 0.1L)		FMF (Range of 0.3L/s)	
	Week 1	Week 4	Week 1	Week 4
M	17	13	16	16
T	15	15	15	17

We conclude that oral metaproterenol has control of pulmonary function parameters in many children comparable to theophylline and may be used as an alternative drug.

INHIBITION OF ANAPHYLAXIS IN AIRWAYS SMOOTH MUSCLE BY THE CALCIUM CHANNEL DRUGS VERAPAMIL AND NIFEDIPINE.

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This study examined the effects of specific calcium channel antagonists upon isometric tension during the Schultz-Dale reaction following passive in-vitro sensitization. Guinea pig trachealis smooth muscle rings were equilibrated aerobically under 2 g isometric tension for 90 minutes at 37°C. Trachealis muscle passive sensitization was accomplished with a 1:10 saline dilution of reconstituted rabbit anti-chicken egg albumin antiserum for 90 minutes. Thereafter, immunospecific anaphylaxis (ANA) was induced with 5X recrystallized ova albumin (OA) (100 ug/ml final bath concentration) and isometric tension recorded. For drug protection studies, either Verapamil (V) or Nifedipine (N) was added to sensitized trachealis before OA challenge. Drug reversal studies were performed by addition of V or N at the peak of ANA tension. Controls received Krebs-Henseleit buffer alone. Data are expressed as mean % inhibition of ANA isometric tension at cited final bath drug concentrations. Mean control ANA tension was 1658 mg ± 198 (SE), (n = 10). Drug pretreatment inhibition of ANA: V = 10 ug/ml, 29.8% ± 14 (SE); V = 100 ug/ml, 51.2% ± 10.3; V = 250 ug/ml, 91.4% ± 3.7; V = 500 ug/ml, 97.0% ± 3.0 (N = 8 per concentration). Mean EC_{50} for V was 85 ug/ml. Verapamil also produced reversal of ANA tension: V = 500 ug/ml, 100% reversal within 15 minutes; control ANA muscles at this time still exhibit 75% of initial tension. In pretreatment studies, N exhibited a 2.5 X greater potency than V (n = 6). Specific calcium channel antagonists are effective in-vitro in preventing or reversing ANA-induced isometric tension in airways smooth muscle. (Supported in part by Foundation for Research in Bronchial Asthma and Related Diseases and Biomedical Research Grant 5-S07RR05660-06 Subgrant 30.) p.22

PULMONARY BAROTRAUMA DURING MECHANICAL VENTILATION IN CRITICALLY ILL PATIENTS. K. Jacobs, M. Hauser, and H. Baier, Division of Pulmonary Disease, University of Miami School of Medicine, Miami, Florida.

The incidence of pulmonary barotrauma (pneumothorax, pneumomediastinum, subcutaneous emphysema) in patients receiving positive-pressure ventilation has been reported to vary between 4 to 18 percent depending among other factors on the type of ventilator used, level of positive end-expiratory pressure (PEEP), and underlying disease. Recently, a much lower overall incidence (0.5%; Anesthesiology 50: 185, 1979) was reported. Since most of these studies were based on a surgical patient collective, we prospectively recorded the incidence of barotrauma in mechanically ventilated patients in a Medical Intensive Care Unit. Over a five month period 108 patients received mechanical ventilation (age 19 to 89 years) with a total of 537 ventilator days (range 1 to 55 days). There was a total of seven complications related to mechanical ventilation, 5 of which were barotraumas. The 5 incidences of barotrauma occurred in 4 patients (age 19 to 77 years) out of a total of 57 who were maintained on PEEP ranging from 5 to 27 torr. Three of these four patients had no previous history of lung disease. There was no barotrauma in patients not receiving PEEP. The overall incidence of barotrauma in this medical patient collective was 4%, but was 8.8% in those receiving PEEP. Mean maximal PEEP values were 8.6 ± 4.3 cm H_2O (± S.D.) for the group without, and 17.8 ± 8.1 cm H_2O for the group with barotrauma ($p<0.05$). Mean peak inflation pressures were 49.9 ± 14.6 cm H_2O in the former (range 25-90 cm H_2O) and 77.5 ± 16.8 cm H_2O (range 42-94 cm H_2O) in the latter group ($p<0.01$). These date suggest that the incidence of barotrauma in medical patients during mechanical ventilation is rather low, but increases significantly during application of PEEP.

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THE SIGNIFICANCE OF FEVER IN ACUTE EXACERBATIONS OF CHRONIC OBSTRUCTIVE AIRWAYS DISEASE. A.K. Raheja and E.B. Weiss. Saint Vincent Hospital, Worcester, Massachusetts.

We prospectively evaluated the incidence of fever and pneumonia in 72 admissions for acute exacerbations of cough and sputum in 50 patients with C.O.A.D. Fever was defined by an oral temperature (T) of ≥ 37.5°C (A.I.Med.91:261, 1979); pneumonia was diagnosed by physical examination, purulent sputum and radiography. None used aspirin in the prior 24 h. Values are mean ± SD. There were 29 men, aged 69 ± 12 y, and 21 females, aged 60 ± 11 y; FVC (liters) 1.52 L ± 0.70, and $FEV_{1.0\%}$ of 45% ± 16. Of 72 total admissions, a T of 38.2°C ± 0.5 occurred in a group of 38% compared to 36.8°C ± 0.3 in the afebrile group ($p < 0.001$). In the fever group, 59% had pneumonia; in those afebrile, 18% had pneumonitis. Blood count indices were analyzed as to sub-groups (WBC, as cells x $10^3/mm^3$, PMN and Band forms as % of WBC):

SUB-GROUP	N	WBC	PMN	BAND FORMS
A) Pneumonia +, Fever +	16	10.4 ± 3.4	71.3 ± 16.0	6.3 ± 7.8
B) Pneumonia -, Fever +	11	12.1 ± 4.2	74.5 ± 12.0	3.9 ± 5.6
C) Pneumonia +, Fever -	8	12.2 ± 5.0	78.7 ± 8.9	3.4 ± 3.1
D) Pneumonia -, Fever -	37	10.9 ± 3.5	74.6 ± 13.6	3.4 ± 5.9

Mean temperatures (°C) for each sub-group were: A) 38.3 ± 0.5, B) 38.0 ± 0.4, C) 37.0 ± 0.4 and D) 36.8 ± 0.3. Analyses of differences (group t) of all WBC, PMN and Band indices within each sub-group were nonsignificant ($p > 0.3$). Isolated sputum bacteria were: Group A = 72%, Group B = 18%, Group C = 28% and Group D = 38%. The predominant organisms were H. influenza, S. pneumonia and S. aureus. Pre-hospital steroid use was similar in all patients (viz. 15%) except the sub-group C with a 25% steroid use. We conclude that fever occurs in 1/3 of patients admitted with exacerbations of C.O.A.D.; of this febrile group, approximately ½ have pneumonia. Interestingly, in the large group of afebrile patients (viz. 62%), 18% exhibited infective pneumonia. Prior steroid therapy may mask T in some afebrile patients with underlying pneumonia. Neither total WBC, PMN nor bands differentiated pneumonic from non-pneumonic patients. (Supported in part by Foundation for Research in Bronchial Asthma and Related Diseases.)

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DELIVERY EFFICIENCY OF METERED-DOSE AEROSOLS BY USUAL ADMINISTRATION AND THROUGH A RESERVOIR BAG. C.S. Kim, B.B. Berkley, and M.A. Sackner. Mount Sinai Medical Center, Miami Beach, FL.

Delivery of aerosols into the lung from hand held metered-dose devices is reduced 40 to 60% because aerosol particles traveling at high velocity impact onto the oropharyngeal mucosa. We employed a reservoir bag of 1.25 liter capacity to receive the aerosol in an attempt to minimize such losses. In the direct delivery method, 2 puffs of aerosol were delivered to the opening of a glass model of the adult oropharynx while a continuous flow of either 10 or 30 lpm of dry and humid (90% R.H.) air was passed through it. In the reservoir bag delivery method, 2 puffs of the aerosol were delivered into the pre-inflated bag and then the aerosol was passed through the model at the same flow conditions used for the direct method. Aerosol particles passing through the model were collected on a filter at its outlet. Mass output of the aerosol from the metered-dose devices and from the bag were determined by collecting the aerosol on filters and weighing with a microbalance. Delivery efficiency was defined as % mass ratio of the aerosol passing through the model to the aerosol output from the device. Delivery efficiencies (%) (30 lpm of dry air) of Bronkometer® (BR), Mistometer® (MS), Alupent® (AL), Duo-Medihaler® (DM), Medihaler-EPI® (ME), Medihaler-ISO® (MI) and Beclovent® (BE) were:

	BR	MS	AL	DM	ME	MI	BE
Bag	47	56	48	58	45	55	40
Direct	38	51	46	56	46	53	38

Decrease of the efficiency by 5-15% was observed either when the flow rate was decreased from 30 to 10 lpm at a same humidity or when the humidity was increased from dry to 90% R.H. under the same flow rate. Almost all the loss of aerosol using the reservoir bag was in the bag rather than the model. Conclusions: 1) the oropharyngeal model simulates *in vivo* impaction loss, 2) delivery of aerosol from the bag eliminates the impaction loss from the metered-dose device thereby potentially preventing systemic absorption of drug through oropharyngeal mucous membrane, 3) the reservoir bag provides slightly greater delivery efficiency than direct administration and 4) in contrast to direct administration, with the reservoir bag there is even distribution of aerosol delivered throughout the entire inspiratory cycle.

ASSESSMENT OF RISK FOR POSTOPERATIVE PULMONARY COMPLICATIONS BY A MULTIFACTORIAL INDEX. D. P. McNally, Division of Pulmonary Medicine, Department of Medicine, University of Connecticut School of Medicine, Farmington, CT.

Factors such as smoking, age, obesity and location of surgery have been identified as increasing the risk of postoperative pulmonary complications, but their relative importance and interactions are not defined. I reviewed retrospectively 100 patients undergoing surgical procedures under general and spinal anesthesia, including 12 genitourinary, 29 orthopedic, 18 ear, nose and throat, 5 thoracic, and 36 general surgical procedures. 23 had postoperative pulmonary complications, defined as radiographic or physical examination evidence of atelectasis, effusion, bronchospasm or laryngospasm, pneumonia or congestive heart failure appearing after surgery. Fever was regarded as a pulmonary complication only when accompanied by another sign, and without an extrapulmonary, obvious emergency surgery, age of 60 or greater, and smoking were significantly associated with postoperative pulmonary complications. Obesity, type of anesthesia, a history of respiratory disease or symptoms, or an abnormal respiratory exam preoperatively were not significantly associated with complications. Multivariate discriminant analysis was used to generate coefficients for a point scoring system (location of surgery 8 points, emergency surgery 5 points, age 4 points, and smoking 3 points) to identify patients at risk. Patients could be divided into two groups based on a point total greater than 5:

	Complicated	Noncomplicated
Low risk	3	56
High risk	20	21

Validated in other settings and applied prospectively, the index may have use in identifying patients for preventative or early therapy of postoperative pulmonary complications.