

INCREASED SPUTUM SALINITY ENHANCES *IN VITRO* CILIARY TRANSPORTABILITY THAT IS POORLY CORRELATED WITH CHANGES IN RHEOLOGY W.M. Chan¹, P.J. Wills², P.J. Cole². ¹Department of Medicine, Queen Mary Hospital, Hong Kong & ²Host Defence Unit, Royal Brompton National Heart and Lung Institute, Imperial College, London SW3 6LR.

To investigate the effects of salt supplementation and depletion on *in vitro* mucociliary clearance of sputum, 8 specimens from 8 bronchiectectic patients and 8 from 6 patients with cystic fibrosis were collected. Each specimen was subdivided and incubated in distilled water or phosphate buffered saline with Na⁺ concentrations ranging from 50mM to 300mM at 50mM increments. Elasticity (storage modulus G') and viscosity (loss modulus G'') of each aliquot of incubated sputum were measured with a parallel plate rheometer (Carrimed CSL 100). The *in vitro* ciliary clearance rates were assayed on a bovine tracheal model to determine the Transportability Index (TI). **Results:** clearance on cilia was significantly slower when sputum was sodium depleted in distilled water (mean TI corrected for original sputum =0.34, 95%CI 0.19-0.48). Clearance was enhanced for sputum equilibrating at Na⁺ concentrations from 150 to 300mM, and was maximal at 200mM Na⁺ (corrected mean TI =1.97, 95% CI 1.19-2.74). Increasing Na⁺ concentration was correlated with a progressive reduction in sputum elasticity and viscosity measured at low (1 rad/s) and high (100 rad/s) stress. (Pearson Correlation Coefficients of Na⁺ concentration with logG' at 1rad/s =-0.63, with logG'' at 1rad/s=-0.63, with logG' at 100rad/s=-0.51, with logG'' at 100rad/s=-0.36, all p<0.001) The correlation with salt altered rheology and transportability, though significant, was poor. The best correlate of transportability was log G'' at 1 rad/s (r=-0.53, p<0.001). **Conclusions:** (1) *in vitro* ciliary clearance of sputum is enhanced by supplementation with salt and retarded by salt depletion, (2) elasticity and viscosity of sputum are negatively correlated with sodium concentration, & (3) effect of salt on ciliary clearance is only partly explained by its effect on sputum rheology.

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SPIROMETRIC VALUES IN NORMAL CHINESE CHILDREN AND ADOLESCENTS

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Ethnic differences are known to affect lung function values. To update spirometric normal values, and to establish normal ranges for lung subdivisions in normal Chinese children and adolescents, an on-going study is undertaken in Hong Kong. The subjects reported here were recruited from 6 schools. A questionnaire was used to exclude anyone with chronic or recent respiratory symptoms (within 4 weeks) or other disease that impair lung function. Tests were performed using Sensor Medics 6200 Body Plethysmograph, and the quality was assured according to the American Thoracic Society standards. There are 421 evaluable tests from girls (age 8-20) and 277 from boys (age 6.8-18.8). We hereby present the spirometric data. Comparison with data published in 1985 from Chinese in Hong Kong shows that the height-predicted mean values of both FEV₁ and FVC in 1995/96 are higher than that of 10 years ago, most remarkable in girls. Comparison with data (1993) from white children in U.K. shows that our FVC values are slightly lower, especially in the 160-170 cm group in girls and 170 cm group in boys.

| Height(cm) | FVC | | | | FEV ₁ | | | |
|------------|-------|------|------|------|------------------|------|------|------|
| | GIRLS | | BOYS | | GIRLS | | BOYS | |
| | I | II | I | II | I | II | I | II |
| 130 | 1.70 | 1.78 | 1.79 | 1.96 | 1.55 | 1.58 | 1.60 | 1.67 |
| 140 | 2.10 | 2.17 | 2.22 | 2.39 | 1.92 | 1.91 | 1.99 | 2.02 |
| 150 | 2.55 | 2.57 | 2.72 | 2.82 | 2.34 | 2.24 | 2.43 | 2.36 |
| 160 | 3.05 | 3.34 | 3.28 | 3.25 | 2.82 | 2.90 | 2.94 | 2.70 |
| 170 | 3.62 | 3.79 | 3.92 | 4.49 | 3.36 | 3.31 | 3.51 | 3.75 |

I= Hong Kong values 1996, II= U.K. values (Connett et al, Thorax 1994)