

## Effect of oscillating airway smooth muscle length on bronchoconstriction – the role of the airway wall

P.B. Noble, P.K. McFawn and H.W. Mitchell, School of Biomedical and Chemical Sciences, University of Western Australia, Crawley, WA 6009, Australia.

A period of deep inspiration in man is known to modulate subsequent bronchoconstriction (Crimi *et al.*, 2002; Kapsali *et al.*, 2000), an effect which may be elicited through direct stretch of airway smooth muscle (ASM). We investigated the response of porcine ASM to a period of length oscillation in three different preparations: whole bronchial segments; bronchial segments which had cartilage removed; and isolated ASM strips. ASM response to electrical field stimulation (EFS) was assessed before and at different time points after ASM length oscillation. In bronchial segments oscillation of ASM length was achieved by cycling intraluminal pressure from 5 to 25cmH<sub>2</sub>O, while in isolated ASM length changes were directly imposed. In each of the three preparations the amplitude of length oscillation was 20-25% of resting ASM length cycled at 0.5Hz for a period of 10 minutes. ASM length and cartilage area were morphometrically determined in airways fixed at 5 and 25cmH<sub>2</sub>O. In whole bronchial segments response to EFS was increased immediately after ASM length oscillation ( $P<0.05$ ). In contrast to whole airways, 5 out of 7 cartilage-denuded airways had reduced response to EFS following length oscillation ( $P<0.05$ ). ASM lengths were not significantly different between control and cartilage-denuded airways at either 5 or 25cmH<sub>2</sub>O. Post oscillation response to EFS was positively correlated to airway wall cartilage ( $P<0.05$ ). In isolated ASM, response to EFS was reduced immediately after length oscillation ( $P<0.01$ ). In each preparation the effect of length oscillation was absent 10 minutes after oscillation had concluded. Our results show that the response of ASM to length oscillation is strongly influenced by the airway wall. Length oscillation enhanced ASM contraction *in situ*, but depressed contraction in isolated ASM. Following cartilage removal, the response of ASM to length oscillation mimicked the depression in contraction observed in isolated ASM, suggesting airway wall structure plays a substantial role in the effect observed with oscillation.

Crimi, E., Pellegrino, R., Milanese, M. & Brusasco, V. (2002) *Journal of Applied Physiology*, 93, 1384-1390.

Kapsali, T., Permutt, S., Laube, B., Scichilone, N. & Togias, A. (2000) *Journal of Applied Physiology*, 89, 711-720.