nebuliser and heating system may be useful in treating dyspnoea in patients with terminal intrathoracic carcinomas. Inhalation of smaller particles with a higher concentration of the drug may result in a greater amount of bupivacaine being deposited deeper in the lungs. We have determined to what extent the median particle size produced by a number of commonly used nebulisers can be decreased by heating.

We studied the Wright nebuliser driven at 13 and 23 L/min, the inspirin Minineb driven at 8 L/min, and the Bird Micronebuliser driven at 7.5 L/min. The nebuliser contained 3 ml of 0.5% bupivacaine and 100 μCi of sodium S-sulphate. The aerosol passed through a 23 cm metal tube which was either at room temperature or was heated so that the aerosol was delivered at 52°C, and was then collected by a 4-stage May Cascade Impactor. The amount of radioactivity collected at each stage and on the final filter was analysed by scintillation counting. We found the Wright nebuliser heated. The total amount of radioactivity collected before and after heating was the same, so that the reduction in MMD due to heating occurred with the Bird Micronebuliser. The aerosol with the smallest MMD was produced by the Wright nebuliser heated. The total amount of radioactivity collected before and after heating was the same, so that the reduction in MMD leads to an increased concentration of bupivacaine in smaller particles.

116 RESPIRATORY MUSCLE FATIGUE REDUCES THE VENTILATORY RESPONSE TO CARBON DIOXIDE


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Human skeletal muscle develops fatigue characterised by selectively reduced force production at low (<20 Hz) stimulation frequencies after sustained high work loads (Edwards et al., J. Physiol., 272, 769-776). Such fatigue develops in sternomastoid (Moehan et al., 1990, Clin. Sci., 59, 463-468) and the diaphragm (Moehan et al., 1981, Thorax, 36, 164-168) after inspiratory loading. If such fatigue is of significance the ventilatory response to carbon dioxide could be reduced.

Three normal subjects breathed through an inspiratory resistance to generate 70% maximum inspiratory mouth pressure with each breath for one hour. After this stress maximum inspiratory mouth pressure was unchanged, but electrical stimulation of sternomastoid showed a reduction in force at 20 Hz compared with 50 Hz from 80.6% (range 77.4-82.3%) to 55.4% (range 52.4-59.2%). Breathing 7% CO2 (Reed, 1967, Aust. Ann. Med., 16, 20-32) before and 10-30 minutes after the inspiratory loading showed that the ventilatory response (litres.min⁻¹.k Pa CO2) was reduced to 56.2% (range 31.3-71.9%) of the control value. The ventilatory response returned to normal at 60-90 minutes. The findings were confirmed by repeat studies on different days in each subject.

The smoothed rectified surface electromyogram recorded from the seventh intercostal space anteriorly progressively increased in amplitude during CO2 rebreathing even when the ventilatory response was diminished after inspiratory loading. Together with the normal maximum inspiratory mouth pressures this suggests that the reduced response to CO2 is due to an impaired contractile response to physiological patterns of excitation rather than reduced muscle excitation. The findings suggest that respiratory muscle fatigue may impair the ventilatory response to a raised PCO2.

Support from the Wellcome Trust and Muscular Dystrophy Group, Great Britain, is gratefully acknowledged.

117 EVIDENCE FOR RESISTANCE TO 25 HYDROXY VITAMIN D, IN THE MALABSORPTION OF CALCIUM OF ELDERLY 'OSTEOPOROTIC WOMEN


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We have previously shown that malabsorption of calcium in the elderly can be corrected by increasing plasma 25OH-D3 within the normal range by treatment with 25 OH-D3 (Francis et al; 1980, Clinical Science 59 14p). We have now investigated whether this is also true of elderly osteoporotic women, who commonly have malabsorption of calcium.

Radiocalcium absorption, plasma 25OH-D3, 1,25 (OH)2 D3 and PTH were measured in 12 women with vertebral crush fractures and 19 women without spinal osteoporosis; they were all aged above 60 and had a normal plasma creatinine. Each subject was treated with 40 mg 25OH-D3 daily for seven days after which the investigations were repeated.

In the non-osteoporotic group, mean (± SEM) plasma 25OH-D3 increased (p < 0.001) from 56.0 ± 4.75 to 130.0 ± 9.5 n mol/l (normal 42.5 - 215.0) and plasma 1,25 (OH)2 D3 from 74.75 ± 6.25 to 142.0 ± 17.5 pmol/l (p < 0.01) (normal 75 - 165). Fractional radiocalcium absorption increased (p < 0.001) from 0.36 ± 0.03 to 0.59 ± 0.05 (normal 0.3 - 1.4) and plasma PTH decreased (p < 0.05) from 451.4 ± 37.5 to 384.1 ± 31.7 pmol/l (normal 53 - 483).

In the osteoporotic group, although both the plasma 25 OH-D3 and 1,25 (OH)2 D3 increased to the same extent as the non-osteoporotic group, there was no significant change in radiocalcium absorption or plasma PTH.

We conclude that malabsorption of calcium in elderly osteoporotic women is not corrected by increasing the plasma 25OH-D3 and 1,25 (OH)2 D3 to levels which improve absorption in non-osteoporotic women. This suggests that elderly osteoporotic women have some resistance to the action of Vitamin D metabolites on the bowel.