

TITLE: DIAPHRAGM CONTRACTILITY AND FATIGUE: THE EFFECTS OF BRANCHED CHAIN AMINO ACIDS (BCAA) AND GLUCOSE

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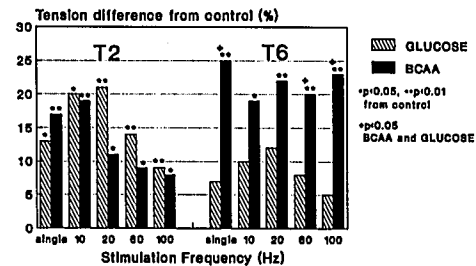
The purpose of this study was to compare BCAA and glucose on contractility and fatigue of isolated rat hemidiaphragm.

We compared two groups, which were equilibrated with either Krebs Ringer Buffer solution (KRB), which contains 200 mg/dl of glucose and a mixture of leucine, valine, and isoleucine (BCAA, n=6), or a higher concentration of glucose (800 mg/dl, n=6). Each group was examined with paired controls (KRB, n=12). Muscles were stimulated directly under complete neuromuscular block. Fatigue was induced by 10 min. stimulation with 30 trains/min of 5 Hz at a 50 % duty cycle. Isometric tension elicited by single and tetanic (10 to 100 Hz) stimulation was measured at baseline (B), after 2 hours of equilibration (T2) and at 0, 10, 30, and 60 (T6)

minutes after induction of fatigue.

The tension difference (% of B in treatment - % of B in paired control) at T2 was 17 ± 3 and 13 ± 5 at single twitch, 19 ± 5 and 20 ± 10 at 10 Hz, 11 ± 6 and 21 ± 8 at 20 Hz, 9 ± 4 and 14 ± 4 at 60 Hz, and 8 ± 3 and 9 ± 3 at 100 Hz (mean \pm SE) in BCAA and glucose, respectively. All values were significantly higher ($p < 0.05$) than paired controls. After induction of fatigue, the recovery at T6 was significantly ($p < 0.05$) better in BCAA compared with control at all frequencies of stimulation. There was no significant difference from control with glucose.

Contractility after equilibration with BCAA or with high concentration of glucose increased in a similar manner; BCAA but not glucose significantly improved recovery from fatigue.



A1153

TITLE: METERED DOSE INHALER DELIVERY DOSE IN CATHETERS AND TRACHEAL TUBES

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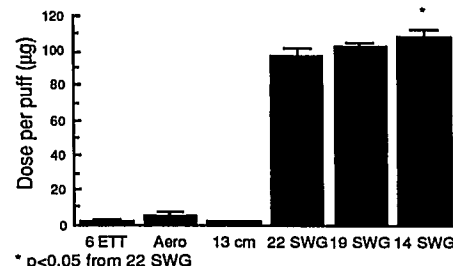
The delivery efficiency of aerosol drugs by metered dose inhaler (MDI) through tracheal tubes (ETT) is very low.^{1,2} Nevertheless, Fernandez et al recently reported improvement in the respiratory function of ventilated patients who received MDI drugs, delivered through a catheter inserted into the tracheal tube.³ Therefore, we investigated the delivery dose of MDI drug with delivery systems consisting of tracheal tubes and catheters.

The delivered dose (DD) of salbutamol (albuterol) (AL) by MDI was investigated using a model that consisted of an actuator swivel (Intec 172245) connected to a 6.0 mm internal diameter ETT, 16 cm in length. The aerosol was delivered through this apparatus into a 20 μ m mesh filter with a continuous flow of dry air at 30 L/min. In parallel experiments, 4 vialon catheters: 22, 19, and 14 standard wire gauge (SWG) each 22 cm long and one 19 SWG 13 cm long were individually inserted through an elbow connector into a 16 cm, 6 mm ETT and the DD determined. In addition the DD was determined for an Aerochamber (Aero), modified for ventilated patients (Trudell). A total of 10 actuations, from 2 different canisters, were directed onto the filters in a closed system for each experiment. The AL aerosol deposited on the filters was dissolved in 5 mls of methanol and then sealed in a test-tube. Each experiment was repeated 3 times and AL dose determined using high pressure liquid chromatography (HPLC). ANOVA and Neuman-Keuls tests were used to compare AL ($p < 0.05$).

The DD (mean \pm SD) of AL per actuation with a 6.0 mm ETT ($2.33 \pm 0.76 \mu$ g) was similar to that for the Aero ($5.17 \pm 2.6 \mu$ g) and the 13 cm long catheter (2.17 ± 0.29). The DD with the 19 SWG ($102.3 \pm 2.5 \mu$ g) and 14 SWG ($108.2 \pm 4.2 \mu$ g) catheters did not differ significantly, however, the DD with a 14 SWG catheter was significantly greater than with the 22 SWG ($97.5 \pm 3.9 \mu$ g) catheter ($p < 0.05$) (Figure).

The delivery of AL by MDI administration is inefficient in a 6.0 mm tracheal tube, but may be dramatically increased using a distally-placed catheter (93-113 μ g). The DD with all 3 diameters of 22 cm catheters is greater than that with a 6.0 mm ETT, Aero and 13 cm catheter, indicating that delivery is not as much a function of catheter diameter but rather a function of the proximity of the distal tip of the catheter to the tip of the ETT. Supported by Glaxo (Canada) Inc.

1. Crogan et al. Anesthesiology 70:1008-1010, 1989
2. Donna et al. Anesthesiology 69:A838, 1988
3. Fernandez et al. Am Rev Resp Dis 141:164-168, 1990



* $p < 0.05$ from 22 SWG