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## Increased Serum Albuterol Concentrations May Be Associated With Elevations Of Serum Lactate In Subjects With Acute Asthma Exacerbations

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### BACKGROUND

We have previously described increased serum lactate concentrations in subjects with acute asthma exacerbations. It is not clear if this is due to increased work of breathing or a possible side effect of treatment (in particular beta-adrenergic agonist therapy).

### OBJECTIVES

- 1) Determine if a significant correlation exists between treatment lactate or  $\Delta$  lactate, and serum albuterol concentrations after adjusting for dyspnea score.
- 2) Determine if elevated treatment lactate concentrations or  $\Delta$  lactate concentrations are associated with increased hospital admissions.

### METHODS

- Interim, subgroup analysis of a prospective, interventional, double-blind, placebo controlled trial of an IV beta-adrenergic agonist in ED patients with acute asthma exacerbations.

- FEV1  $\leq$  50% predicted 30 minutes following initiation of “standard care” (includes a minimum of 2.5 mg nebulized albuterol; 0.5 mg nebulized ipratropium; and 50 mg of a corticosteroid). ED physicians, unaware of study objectives, administered all treatments.

- Subjects were randomized in a 1:1 ratio to either placebo or an investigational intravenous beta agonist arm. Blood was obtained at 1 and 1.25 hours after the start of the hour long infusion for determination of albuterol, electrolytes, and lactate concentrations; and a Modified Borg Dyspnea Score (DS) was calculated for all patients.

- Treatment lactate and  $\Delta$  lactate were correlated with 1 hr serum albuterol concentrations and hospital admission, using partial Pearson correlations to adjust for DS.

### RESULTS

- 42 subjects were enrolled to date, 20 with complete data.

- The mean baseline serum lactate level was 19.3 mg/dL (SD  $\pm$ 9.5). This increased to 32.6 mg/dL (SD  $\pm$ 15.8) at 1.25 hrs.

- The mean 1 hr DS was 3.85+ 2.0.

- The correlation between treatment lactate,  $\Delta$  lactate, 1 hr serum albuterol concentrations (R, S and total) and admission to hospital are shown (see table below). Both treatment and  $\Delta$  lactate were highly correlated with total serum albuterol, R albuterol, and S albuterol.

		R Albuterol	S Albuterol	Total Albuterol	Admit
<b>Treatment Lactate</b>	<b>Correlation Coefficient</b>	<b>0.505</b>	<b>0.497</b>	<b>0.674</b>	<b>-0.018</b>
	<b>Significance (2 tailed)</b>	<b>0.028</b>	<b>0.030</b>	<b>0.002</b>	<b>0.910</b>
<b>Delta Lactata</b>	<b>Correlation Coefficient</b>	<b>0.519</b>	<b>0.525</b>	<b>0.605</b>	<b>-0.075</b>
	<b>Significance (2 tailed)</b>	<b>0.023</b>	<b>0.021</b>	<b>0.006</b>	<b>0.643</b>

### RESULTS (cont.)

- There was no correlation between treatment lactate or  $\Delta$  lactate and hospital admission. There was also no significant difference in mean lactate levels in admitted vs. non-admitted subjects (32.8 mg/dL vs. 32.1 mg/dL, p=0.9).

- There was a trend in twenty-four hour DS in patients with markedly elevated lactate ( $\geq$  30 mg/dL) compared to those with lactate < 30 mg/dL (3.19 vs. 1.88, p=0.08)

### DISCUSSION

Lactic acidosis may be caused by increased production (Type A) or decreased utilization (metabolism) (Type B). <sup>1</sup> Type B lactic acidosis may be caused by alcohol or drugs. There have been several reports of increased lactate associated with beta agonists. <sup>2</sup> A recent study in children treated for acute severe asthma, showed that the mechanism of lactic acidosis was most often Type B. <sup>3</sup>

### CONCLUSION

Lactate and  $\Delta$  lactate concentrations correlate with albuterol concentrations in patients presenting with acute asthma exacerbations after adjusting for dyspnea score, but do not correlate with hospital admission.

### REFERENCES

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