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Kristen Aubuchon

Washington University School of Medicine in St. Louis

Kazuko Matsuda

Washington University School of Medicine in St. Louis

Stacey House

Washington University School of Medicine in St. Louis

John Schneider

Washington University School of Medicine in St. Louis

Lawrence Lewis

Washington University School of Medicine in St. Louis

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

Kristen Aubuchon¹, Kazuko Matsuda², Stacey L. House¹, Ian Ferguson¹, John Schneider¹, Lawrence Lewis¹

¹Division of Emergency Medicine, Washington University School of Medicine, St. Louis, Missouri; ²Medicinova, Inc., San Diego, CA



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 Δ lactate, and serum albuterol concentrations after adjusting for dyspnea score.
- 2) Determine if elevated treatment lactate concentrations or Δ 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 Δ 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, Δ lactate, 1 hr serum albuterol concentrations (R, S and total) and admission to hospital are shown (see table below). Both treatment and Δ lactate were highly correlated with total serum albuterol, R albuterol, and S albuterol.

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

RESULTS (cont.)

- There was no correlation between treatment lactate or Δ 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). ¹ Type B lactic acidosis may be caused by alcohol or drugs. There have been several reports of increased lactate associated with beta agonists. ² A recent study in children treated for acute severe asthma, showed that the mechanism of lactic acidosis was most often Type B. ³

CONCLUSION

Lactate and Δ 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.

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