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Decreasing pH of Mammary Gland Secretions Predict Foaling and Are Correlated With Electrolyte Concentrations in Prefoaling Mares

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Mammary secretion pH declined significantly in mares within 24 hours before foaling, with 11 of 14 mares foaling in <24 hours when the pH level was ≤7. The pH of mammary secretions was correlated (P < 0.001) with Na⁺ (r = 0.87), Cl⁻ (r = 0.85), Ca²⁺ (r = −0.88), and K⁺ (r = −0.8). These results suggest that serial assessment in the pH of mammary gland secretions can replace serial electrolyte measurements. Authors’ addresses: Reproduction Laboratory, The Maxwell H. Gluck Equine Research Center, Department of Veterinary Science, University of Kentucky, Lexington KY 40546-0099 (Ball, Canisso, Davolli, Troedsson); Faculdade de Medicina Veterinária e Zootecnia, Departamento de Radiologia e Reprodução Animal, Universidade Estadual Paulista, Botucatu, São Paulo, 18618-970, Brazil (Silva); e-mail: b.a.ball@uky. *Corresponding author; †presenting author. © 2013 AAEP.

1. Introduction

Methods to predict impending parturition in mares allow close supervision and provision of support to the mare and foal during parturition. Serial electrolyte measurements in mammary gland secretions are commonly used to predict foaling. A recent study reported that a reduction in the pH of mammary gland secretions could predict parturition; therefore, the objectives of this study were to determine the pH of mammary gland secretions and corresponding associations with electrolyte concentrations in prefoaling mares.

2. Materials and Methods

Fourteen normal foaling mares were monitored daily from 310 to 320 days of gestation age until parturition. The mares underwent daily physical examinations between 5:30 and 6:30 pm. Prefoaling mammary gland secretions were collected, and the pH was immediately determined by a portable device coupled with a semi-micro electrode. The pH readings and pH meter calibrations were performed according to manufacturer’s instructions with the use of buffer solutions (ie, acid buffer pH = 4, neutral pH = 7). A small aliquot of mammary secretion was frozen (−20°C) until further analyses. After parturition, samples from day −4 to day 0 (day of foaling) were thawed, and electrolyte concentrations were determined with an automated analyzer. The electrolytes analyzed included Ca²⁺, Mg²⁺, Na⁺, K⁺ and Cl⁻. The data were analyzed by means of repeated-measures analysis of variance, and individual means were compared by means of a
Correlations were determined between pH and electrolyte concentrations by the Pearson product-moment for each pair.

3. Results and Discussion
There was significant reduction in the pH of mammary secretions on the day of foaling ($P < 0.0001$), and most mares (11/14) with a pH $\leq 7$ foaled within 24 hours. The pH of mammary secretions of all mares on the day of foaling was $7.0 \pm 0.16$ (mean $\pm$ SEM). In addition, there were significant ($P < 0.05$) increases in Ca$^{2+}$ and K$^+$ concentrations and significant decreases in Na$^+$ and Cl$^-$ concentrations from 1 day before to the day of foaling. The pH of mammary secretions was highly and significantly ($P < 0.001$) correlated with Na$^+$ ($r = 0.87$), Cl$^-$ ($r = 0.85$), Ca$^{2+}$ ($r = -0.88$), and K$^+$ ($r = -0.8$) concentrations. These results suggest that serial assessment in the pH of the mammary gland secretions can replace serial electrolyte measurements.

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Footnotes
\textsuperscript{a}Fisher Scientific Accumet AP 115 Portable pH Meter, Thermo Fisher Scientific, Inc, Marietta, OH 45750.
\textsuperscript{b}AU480 Beckman Counter, CH 1260 Nyon Switzerland.
\textsuperscript{c}JMP 9, SAS Institute, Cary, NC 27513.