

Vetrabutine clorhydrate use in dystocic farrowings minimizes hemodynamic sequels in piglets

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Received 29 January 2011; received in revised form 18 February 2012; accepted 18 February 2012

Abstract

The objective was to measure the effects of VC (a uterotonic drug with vasodilator effects) in eutocic and dystocic sows, on the acid–base balance and some vitality traits of piglets at birth. Farrowing was induced with prostaglandin F₂ α . Four groups of sows (20 sows/group) were monitored; Groups 1 and 2 were eutocic sows, whereas Groups 3 and 4 were dam-fetal dystocic sows. Groups 1 and 3 (control) were given saline, whereas Groups 2 and 4 were given VC im (1.66 mg/kg of body weight) after the first piglet was born. Piglets' physio-metabolic performance was monitored peripartum. Treatment with VC reduced ($P < 0.0001$) the percentage of intrapartum stillbirths in sows either with eutocic (5.2 vs. 10.0%) and dystocic (7.6 vs. 16.7%) farrowings and increased ($P < 0.0001$) the number of pigs born alive without any evidence of AFS (89.9 vs. 79.9%, eutocic and 81.6 vs. 65.2%, dystocic). In addition, for the group of pigs with no acute fetal suffering (AFS), VC treatment enhanced survival responses with a half point greater vitality score in Group 4; it also reduced the latency to first teat contact by 6 min ($P < 0.05$) in both treated groups compared to controls; and it improved the condition of the pigs' umbilical cord, with more adhered (98 vs. 86% in eutocic and 88 vs. 80% in dystocic; $P < 0.05$) and less ruptured cords. Moreover, VC reduced the severity of adverse physio-metabolic indicators and the acid–base balance of piglets with AFS at birth by lowering blood lactate (89.8 vs. 93.5 mmol/L in eutocic groups and 94.6 vs. 100.2 mmol/L in dystocic groups; $P < 0.05$), $P_a\text{CO}_2$ and Ca^{2+} , and by increasing blood pH, HCO_3 and $P_a\text{O}_2$ levels ($P < 0.05$).

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Keywords: Vetrabutine clorhydrate; Farrowing sow; Uterotonic; Neonatal viability; Dystocia; Blood variables

1. Introduction

Parturition is a critical event in polytocous species [1–4]. In pigs, 3% of sows have maternal dystocia and 35% of farrowings have evidence of fetal suffering [5].

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Sows are of particular interest, since within a litter, acid–base balance of piglets are quite variable [6–7], representing a degree of either metabolic or respiratory acidosis [8–12]. Furthermore, alterations of some aspects of acid–base balance (glucose, lactate, pH, $P_a\text{CO}_2$), as asphyxia indicators, are much more common in newborn piglets born from dystocic farrowings [12]. Although a moderate asphyxia intrapartum is considered normal in all piglets, some have a high degree of asphyxia, due to the cumulative effects of successive contractions and injury or rupture of the umbilical cord [6]. Furthermore, the last piglet born is more likely to be born dead [13,14] or affected by asphyxia. Indeed, there is a relationship between birth assistance and the likelihood of stillbirth due to obstetrical manipulation to correct dystocia [1].

Although oxytocin reduces the duration of farrowing, its use either alone or after prostaglandin-induced parturition has been associated with dystocia and/or higher stillbirth rates in parturient pigs [15,16]. In this regard, dystocia has often not been well managed clinically, since it is not necessary that the sow experiences distress or to wait until many piglets are dead or compromised to confirm the presence of dystocia [17]. More research is needed to identify the primary determinants of stillbirths and thereby reduce the incidence of these losses [18,19]. In that regard, the parity of the sow, farrowing assistance, and animal breed and gender, have been related to perinatal mortality [1,20].

In previous studies, VC, a muscletropic spasmolytic and derivative of papaverine [22] which acts directly on the smooth muscle fibers and has no neurotropic activity, increased the duration of Stage II parturition by 35 min. However, the prevalence of unfavorable outcomes for piglets was reduced in VC-treated sows compared to controls [21,22]. Nevertheless, little attention has been given to examine the influences of VC in sows with eutocia vs. dystocia. Thus, the objective of the present study was to measure the effects of a single dose of VC in eutocic and dystocic sows, on the acid–base balance and some vitality traits of piglets at birth.

2. Materials and methods

2.1. Sows

This study was conducted on a commercial pig farm (in Mexico) with approximately 50 farrowings each week. One wk before the expected parturition date, sows were housed in individual crates (with slatted floors) in a farrowing room with the following conditions: an electronic ventilation system, natural lighting

(set at 39.8; Fc –200), average environmental temperature 26 °C, relative humidity of 60%, and no wind.

Farrowing was induced with prostaglandin F2 α (dinoprost tromethamine; Lutalyse, Pharmacia & Upjohn, D. F, Mexico) 24 h before the expected farrowing date, with monitoring started 12 h after treatment. Assistance was provided to all sows during farrowing and piglets at birth; however, obstetrical manipulation was maintained at a minimum, so that farrowing performance data were minimally affected. A total of 80 Yorkshire x Landrace multiparous sows (2nd to 4th parities), were allocated in four groups (20 sows/group); Groups 1 and 2 were eutocic sows, whereas Groups 3 and 4 were dam-fetal dystocic sows. Groups 1 and 3 (control) were given saline (1 mL per 60 kg of live weight), whereas Groups 2 and 4 were treated with 1.66 mg/kg of VC im (Monzal, Boehringer Ingelheim Vetmedica, SA de CV, Guadalajara, Jal, Mexico) after the first piglet was born. All treatments were injected in the neck muscle. According to González-Lozano [17], a maternal-fetal dystocia was considered when at least one of the first four expelled piglets was an intrapartum stillbirths (IPS), because of acute fetal suffering (AFS), or had symptoms of AFS. In addition, dystocic sows had uterine contractions above 30 mm/Hg, compared to <30 mm/Hg from eutocic sows and they also showed uterine atony for at least 40 min, these were monitored with an electronic digital tococardiograph (Fetal Monitor Medical Systems, Inc., CT, USA), farrowings were assisted when the interval between piglets exceeded 40 min. Monitoring was done as described [23,24] in all sows, throughout the second stage of parturition. The uterine transducer was placed with abundant obstetrical gel (Farmacéuticos Altamirano de México, S.A. de C.V., Mexico City) on the abdomen of the sow. Patterns of uterine contractions were recorded on thermal paper.

2.2. Piglets

For every farrowing, litter size, piglets born alive and those with IPS were recorded. Stillbirths were classified as ante-partum or intra-partum, based on a complete necropsy examination [21,23,25] conducted within 20 min after expulsion. Preterm neonates were also subjected to a necropsy examination. Bradycardia was defined as fetal heart rate <120 heartbeats per min, and tachycardia when it was >160 heartbeats per min [23]. To quantify the degree of asphyxia that a fetus suffered in utero, fetal heart rate decelerations and AFS were identified and attributed to transitory occlusion of umbilical vessels secondary to uterine contractions, as

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