

Peripartal plasma concentrations of 15-ketodihydro-PGF_{2α}, cortisol, progesterone and 17-β-estradiol in Martina Franca jennies

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Received 9 July 2010; received in revised form 29 September 2010; accepted 9 October 2010

Abstract

The transition from intra- to extrauterine environment represents a very delicate phase, in which the successful coordination of maturation is strictly connected with several hormonal changes during the last weeks of gestation and at parturition. While the peripartal endocrinology in the mare has been deeply investigated, the peripartal hormonal changes in the jenny need further evaluation. The aim of this study is to evaluate the mean 15-ketodihydro-PGF_{2α} (PGFM), cortisol (C), progesterone (P4), and 17β-estradiol (E2) levels during the peripartal period in this species. Ten Martina Franca jennies, with normal gestational length and parturition, were enrolled. From each jenny, blood was collected twice a day from 10 d before to 7 d after parturition and from the plasma obtained PGFM, C, P4 and E2 were analyzed by RIA. Higher, constant PGFM concentrations were observed in the pre-foaling days compared to the decreasing levels detected the days after delivery, as previously observed in the mare. During the whole period of observation no significant differences in plasma C levels were detected. In contrast to the mare, P4 has always been detectable and the highest level found at –2.5 days was significantly different compared to samples obtained between –10 and –4.5 days and between 1.5 and 7 days after foaling. Finally, E2 showed higher concentrations before foaling, with the highest values between –3 and –1.5 days, decreasing only one day before foaling. A positive correlation was found between PGFM and P4, during the last 4 days of gestation, while a positive correlation between PGFM and E2 was observed during the prepartum. Despite some similarities with the mare exist, differences have been found in P4 and E2 profiles, underlining once more the differences in the physiology of this two species.

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Keywords: Hormones; Jenny; Peripartum

1. Introduction

In the last years, as a consequence of the Food and Agriculture Organization (FAO) indications, the Martina Franca donkey breed has been considered as endangered, and several research projects were focused

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on the reproductive physiology of this species [1–4]. The improvement of reproductive performance, based on detailed knowledge of both male and female reproductive activity, is something essential for the process of repopulation of this breed. Given the considerable length of donkey pregnancy and the condition of monotocous species, a healthy pregnancy and the birth of a live, viable foal are necessary prerequisites for successful reproduction.

The transition from intra- to extrauterine environment represents a very delicate phase, in which the successful coordination of maturation has to be present [5]. All these events are strictly connected with several hormonal changes during the last weeks of gestation and, above all, during the last days and at the moment of delivery [5]. Although most of the hormones involved in the process of parturition and in the postpartum period are the same in different species, their concentrations, profiles and changes during the periparturient period differ among species [6]. Moreover, since horses and donkeys belong both to the genus *Equus*, they are often considered as equal for anatomy and physiology, but several studies demonstrated that they have specific, unique characteristics [1–4].

For these reasons, even if the periparturient endocrinology in the mare has been deeply investigated [5–10], the periparturient hormonal changes in the jenny need further investigation [11].

The principal hormones involved in this phase are: progestagens, estrogens, cortisol (C), and prostaglandins (PG).

Progestagens and estrogens are produced from the foetus, then metabolized by the placenta and finally act on the uterus [6]. This underlines the deep connection between the endocrinal status of the mare and the activity of the foetal hypothalamo-pituitary axis, and the hormonal cascade that starts in the foetus is responsible for the subsequent spreads into the maternal tissues and the beginning of parturition [6].

It has been reported that in the late pregnant mare, in contrast to other species, progesterone (P4) levels are less important than other progestagens, such as 5 α -pregnane,3,20-dione (5 α -DHP), and from midgestation on is generally undetectable [5,6]. In the mare, total progestagens levels increase and total oestrogens concentrations decrease during the last 20–30 days of pregnancy with a following trend reversal 24–48 hours before delivery [10]. However, Haluska and Currie [7] found that also peripheral concentrations of progesterone increase slightly during the last 2 weeks prepartum and then decrease at parturition and after placental

expulsion as confirmed from Seren et al [12] and Pope et al [13]. In the jenny, one study has found detectable concentrations of P4 during the whole pregnancy, with low levels between day 165 and 15 before parturition and an increase in the last few days [14].

Very close to term, fetal equine adrenals start to produce C, inducing a surge of this hormone and a rapid maturation of the fetus [10]. In contrast to other species, in which C increases during the last few weeks of pregnancy, in the mare the rise of fetal C can be observed only 2–3 days before parturition [5]. This increase could also contribute to the increased uteroplacental production of oestradiol 17 β (E2) and PG [10]. In fact, even if the mare differs from most of mammals since total estrogen concentrations decline before parturition, E2 increases during the last week because of its action on uteroplacental tissues to stimulate PG release [5,6]. Basal estrogen levels have been observed at the first day postpartum [15].

The fall of progestagens production lifts the block on myometrial contractility and the increase in PG production induces myometrial contractions [10]. During the second half of pregnancy 15-ketodihydro-PGF_{2 α} (PGFM, the main and most stable metabolite of PGF_{2 α}) levels are low, increase toward term, peaking during the second stage of labour, when a 50-fold increase can be observed, and then rapidly decrease [5–7,9,16].

Since the mare has so many peculiar characteristics in the periparturient hormonal changes and since a paucity of similar information regarding jennies are available in literature, the aim of this study is to evaluate the mean PGFM, C, P4, and E2 levels during the periparturient period in this species.

2. Materials and methods

2.1. Animals and clinical data

The study was conducted on 10 Martina Franca jennies, 5–18 years old, kept at the Chiareto country estate, belonging to the Faculty of Veterinary Medicine of Teramo, Italy. The jennies had been successfully mated and monitored throughout gestation, to check for the normal development and viability of the fetus. At term, the jennies were allowed to foal spontaneously, under observation but without obstetric intervention.

All foalings included in the study were normal, providing the following criteria, previously evaluated in the mare [17–22]: delivery in recumbency; allanto-chorion rupture and fetal delivery unassisted; dorsal anterior presentation of fetus; second stage of foaling

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