RELEASE OF PROSTAGLANDIN F-2 α DURING FOALING IN MARES

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Summary. The concentrations of PGF-2 α in the peripheral blood of five foaling mares were measured by radioimmunoassay. Low levels of PGF-2 α were detected as early as 1 week before foaling in two of the mares. These levels increased steadily, reaching a peak (1.74 ± 0.44 ng/ml) during fetal expulsion. A relatively high PGF-2 α level was found in samples collected 60 min after foaling.

Prostaglandins have only recently been implicated in the process of parturition. Increased concentrations of prostaglandin F-2 α before and during parturition in women (Karim, 1968; Guttierrez-Cernosek *et al.*, 1972), and sheep (Liggins & Grieves, 1971; Thorburn *et al.*, 1972) have been reported. This paper describes the circulating levels of PGF-2 α in the peripheral blood of mares at the time of foaling.

Five healthy light-grade mares, weighing approximately 450 kg and inseminated by two normal fertile stallions, were used. All mares were palpated rectally for the presence of a conceptus 45 days after mating. The expected foaling date was extrapolated from the time of conception. All mares were housed in individual stalls in a foaling barn and checked daily during the last month of gestation for clinical signs of foaling. Blood samples were collected by jugular venepuncture into cold heparinized vacutainer tubes (Becton-Dickinson) 1 week before the expected foaling date and served as a 'control' for the individual mares. Similar samples (approximately 15 ml) were collected at 30, 15 and 5 min before and at 0, 1, 5, 15, 30 and 60 min after foaling. The interval during which the fetus remained in the cervical canal was regarded as actual foaling time (zero time). The plasma was separated by centrifugation at 1300 *g* for 10 min and stored at -19°C until assayed.

The antiserum against PGF-2 α used in this study was produced in goats and is specific for F-type prostaglandins (Kirton *et al.*, 1972). The cross-reactivity with PGE, PGA or PGB was $<0.1\%$.

The extraction and purification of PGF-2 α were carried out on 1-ml samples of plasma by the method of Caldwell *et al.* (1971). To account for procedural losses, 1500 ct/min of [^3H]PGF-2 α (sp. act. 9.2 Ci/mmol: New England Nuclear, Boston, Massachusetts) were added to a third aliquot from a representative of the samples to be analysed (10–15 within each assay). The radioactivity remaining in the purified extract was counted and % recoveries calculated to determine

a single correction factor. The recovery was $81.6 \pm 4.2\%$ of the added radioactivity.

Radioimmunoassay was performed according to the technique of Kirton *et al.* (1972), but was modified by use of dextran-coated charcoal (Caldwell *et al.*, 1971) to separate the antibody-bound and free prostaglandin. A standard curve was constructed from results obtained by incubating antibody (100 μ l of a 1:500 dilution of serum) in 250 μ l of 0.05 M-tris-HCl buffer, pH 7.4, with constant amounts of [3 H]PGF (2000 ct/min) and various quantities (0–5 ng) of unlabelled PGF for 4 hr at 5°C. The tubes were centrifuged (1500 g for 5 min) 15 min after addition of 200 μ l dextran-charcoal suspension and 200 μ l of the supernatant transferred to a scintillation vial for counting of the radioactivity.

Three aliquots (250 μ l) of each sample to be assayed were transferred to assay tubes, and the radioimmunoassay was run in duplicate with the third tube serving as a plasma blank for the unknown. The overall precision was estimated by determining known amounts (200 pg) of PGF-2 α in 250 μ l plasma from a mare in early pregnancy (60 days after conception). The PGF-2 α assayed in these tubes was 209 ± 22.3 and the coefficient of variation 11.01%.

Table 1. Blood levels of prostaglandin F-2 α in mares at the time of foaling

Time of sample collection (min)*	PGF-2 α (pg/ml)					Mean $\pm$ S.E.
	Mare 1 (330)†	Mare 2 (327)†	Mare 3 (335)†	Mare 4 (337)†	Mare 5 (333)†	
Control‡	N.D.	312	N.D.	280	N.D.	—
–30	480	312	300	352	320	361 ± 82.0
–15	520	472	344	400	364	420 ± 74.2
–5	1000	508	800	480	640	625 ± 218.6
0	2420	1560	1200	1800	1720	1740 ± 444.5
+1	2200	2360	1440	1400	1440	1768 ± 471.1
+5	1560	2060	1100	1200	1400	1464 ± 377.7
+15	1120	1660	800	1000	1280	1172 ± 324.2
+30	880	840	712	480	1200	822 ± 262.5
+60	680	760	720	400	640	640 ± 141.4

* In relation to foaling at zero time when the foal was in the cervical canal.

† Length of gestation in days.

‡ Sample taken 1 week before expected date of foaling.

The PGF-2 α concentrations in mares during foaling are given in Table 1. There was no measurable concentration of PGF-2 α in the control samples of three of the mares studied. Peak levels of PGF-2 α occurred with the onset of cervical dilatation and acute labour. There was no specific pattern of PGF-2 α release except that after the peak concentration levels of PGF-2 α declined in all mares. Expulsion of the foal in these mares lasted from 10 to 15 min and the afterbirth was expelled by all mares by 1–2 hr after foaling.

The concentration of PGF-2 α increases in the blood serum during labour in women and declines sharply immediately following parturition (Brummer, 1972; Guttierrez-Cernosek *et al.*, 1972). The findings of the present study clearly show that PGF-2 α levels also increase in the peripheral blood of mares during foaling.

Stretching of myometrial tissue, cellular damage and stress have been reported to induce release of PGF-2 α , particularly in primigravidae (Poyser *et al.*, 1971). The more the cervix is dilated the higher the concentration of plasma PGF (Brummer, 1972). Differences in the blood plasma levels of PGF-2 α in the mares in the present study could have been due to differences in parity or the type of labour.

Spontaneous contractions in the gravid uterus have been reported to exist weeks before the time of parturition (O. W. Shier, personal communication). Since two of the mares studied had detectable amounts of PGF-2 α in the control samples, it is possible that early spontaneous contractions of the uterus or uterine contractions induced by fetal movements might have been responsible for the presence of PGF-2 α in these samples. It is also possible that these values are normal since low levels of PGF-2 α have been reported to appear in the blood before the onset of labour (Green *et al.*, 1974). These sustained low concentrations of PGF-2 α 60 min after foaling may have been due to continued low synthesis of PGF-2 α since the placenta was still retained in these mares.

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