



Section of Comparative Medicine

President C R Coid MRCVS

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Perinatal Development [Abridged]

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A Clinician's View of Prematurity and Dismaturity in Thoroughbred Foals

Newborn maturity implies the ability to adapt to the extrauterine environment without the need for intensive care, but any definition must be qualified by the extent to which the environment can nowadays be artificially altered. Avery (1964) observed that, before extrauterine life is possible, organ maturation must evolve to a degree capable of function. But prematurity is not regarded as a disease in its own right (Morison 1970).

Prematurity, in the context of equine birth, describes foals which are weak and perhaps smaller than to be expected at birth. The term may be used for foals with a gestational development shorter from full term (95% range 325-355 days) but longer than the pre-viable period of

300 days. Signs of prematurity are weakness, as evidenced by delay in standing for the first time (normal foals usually stand within two hours of birth), low birth weight (mean for full-term thoroughbred foals is 49.6 ± 0.45 kg) and, in some cases, an emaciated appearance, meconium staining, 'silky' skin, red or orange-red tongue and buccal mucous membranes. Some affected foals may become stronger during the second day *post partum*, progressing to normal or near normal size and development, but others become weaker, developing signs of extensor rigidity, opisthotonus, loss of suck reflex, blindness and coma, and die within a week.

In thoroughbred horses considerable familial variation in birth weight occurs. Reported means of randomly selected groups are 50 kg (Rossdale 1966) and 50.9 kg (Jeffcott & Whitwell 1973). Fig 1 shows the mean birth weights of 144 normal thoroughbred foals with a gestation of more than 320 days, divided into 10 day periods and compared with the weights of 14 foals of 300-319

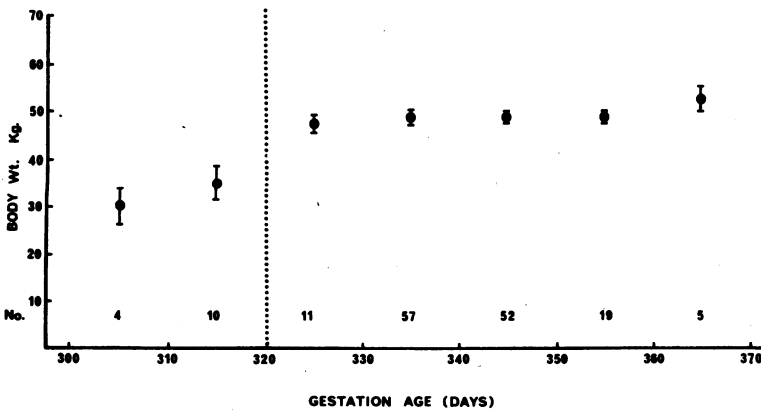


Fig 1 Birth weight of 158 thoroughbred foals shown as means at 10 day intervals of gestation. (see text and Table 1)

days' gestation. The data indicate that mean birth weight is not affected by gestational age after 320 days, but is significantly lower in the period 300–319 days ($P < 0.05$). Of foals with a gestation period exceeding 320 days, first-born foals had a significantly lower birth weight (mean 43.8 ± 1.15 kg) than later-born foals (mean birth weight 50.6 ± 0.45 kg ($P < 0.05$)); twins had a very significantly lower weight (see Table 1).

Table 1

Mean birth weights (\pm s.e.) of 144 full-term and 14 premature foals

	No.	Mean birth weight (kg)
Full-term foals:		
Total	144	49.6 ± 0.45
First-born	25	43.8 ± 1.15
Later-born	119	50.6 ± 0.45
Twins	6	20.4 ± 0.81
Premature foals	14	33.8 ± 2.5

Premature foals have a similar homeothermic status to those born at full term and usually maintain rectal temperatures in the range 37–39°C. Plasma glucose levels are near to those in full-term foals – mean 95.5 ± 17.44 mg/100 ml (Kitchen & Rossdale 1975) although in some cases they may be below 60 mg/100 ml (unpublished data).

Meconium is passed completely within three days following birth, but premature foals which fail to survive often exhibit signs of tympany and colic associated with alimentary stasis.

PaO_2 , V_T and \dot{V} are normal during the first day *post partum*, but there is a diminution of PaO_2 and increasing respiratory rate in those cases which suffer a worsening condition on the second or third day. There is no evidence to suggest that the deteriorating respiratory status is associated with an absence of pulmonary surfactant.

The metabolic status of premature foals is similar to that of full-term individuals, but a marked increase in plasma lactate and decreasing plasma bicarbonate levels are found in foals which fail to survive. Premature foals tend to have lower initial plasma cortisol levels than those found in normal full-term foals (Nathanielsz *et al.* 1975).

The term dysmaturity (Sjostedt *et al.* 1958, Gruenwald 1963) has been borrowed to describe foals born after a gestational period of more than 320 days but showing premature-like signs and evidence of gross placental pathology or meconium staining. Chronic placental deprivation may be suspected in cases of low birth weight (> 2 s.d. below the mean, i.e. 38.9 kg) and diminished crown-rump length (< 95.5 cm). The influence of

placental surface area on fetal size is well illustrated by twin fetuses (see Jeffcott & Whitwell 1973). However, further studies are required to define the effects of placental dysfunction and reduced gestational length on fetal development in the horse.

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Conventional and High-volume Feeds in Infants of Low Birth Weight

Large weight gains have been reported in infants of low birth weight receiving high-volume milk feeds (Valman *et al.* 1972). We have performed balance studies on conventional and high intakes in 5 infants of low birth weight to determine the proportion of nitrogen, fat and calories retained. A new balance technique has been used.

Patients

Five infants weighing between 1.1 and 1.5 kg at birth were studied and their gestational ages were between 28 and 33 weeks. The ages of the infants at the beginning of the initial balances ranged between 12 and 47 days. The study was approved by the hospital ethical committee and informed consent was obtained from each mother.

Balance Method

Metabolic balances were performed sequentially on each infant, on about 230 ml/kg per day of SMA S26 milk, or on 180 ml/kg per day. Each volume was given for at least five days and collections of stool and urine were made on the final three days.

The responsibility for the care of each infant being studied was given to one senior member of