

# Plasma prolactin concentrations after caesarean section or vaginal delivery

Lindsay Heasman, John A D Spencer, Michael E Symonds

## Abstract

**The umbilical venous plasma prolactin concentrations of three groups of term infants were compared immediately after birth. Samples were taken following seven vaginal deliveries, eight emergency caesarean sections performed during labour, and 12 elective caesarean sections before labour. Mean concentrations of prolactin were significantly lower in the elective caesarean section group compared with the labour groups. This result indicates that the fetal hypothalamic-pituitary axis is stimulated during labour which could explain the increase in plasma prolactin concentrations at birth.** (*Arch Dis Child* 1997;77:F237-F238)

Keywords: caesarean section; labour; prolactin

Prolactin has an important role in a variety of fundamental physiological processes involved in growth and metabolic control. These include skin, wool and hair formation, salt and water balance, reproduction and lactation. Several investigations have indicated that prolactin is critical to fetal growth and maturation in several species including rats, human beings, and sheep.<sup>2-5</sup> Prolactin receptor mRNA is present in a wide range of tissues in the fetal rat, including the lung and brown adipose tissue.<sup>2</sup> In infants, plasma prolactin concentrations are strongly correlated with gestational age but the extent to which reduced prolactin concentrations are an indicator of inappropriate growth and development remains controversial.<sup>3-6</sup>

One factor that has not been taken into account when considering the relation between maturity at birth and plasma prolactin concentrations is route of delivery. Caesarean section delivery near term has a pronounced effect on endocrine adaptation in newborn infants and lambs.<sup>7-8</sup> This is partly due to reduced stimulation of the hypothalamic-pituitary axis because the fetus is not subjected to the physical stress associated with labour. Our study was designed to examine the influence of labour on the fetal

level of prolactin immediately after birth by comparing umbilical concentrations in groups of babies delivered after labour with a group delivered by caesarean section before labour.

## Methods

The babies from 27 uncomplicated pregnancies were studied. Seven labours ended with vaginal delivery and eight required emergency caesarean section. The remaining 12 underwent elective caesarean section before labour. Umbilical venous blood samples diluted with heparin were obtained immediately after birth from a double clamped segment of umbilical cord. After centrifugation the plasma was collected and stored at -20°C until analysis.

Umbilical plasma prolactin concentrations were measured using a magnetic solid phase immunoenzymatic assay kit following 50% dilution of all samples (Prolactin Serozyme, Serono Diagnostics Ltd, Fleet, Hants). The upper and lower limits of detection were 250 and 0.2 ng/ml, and intra- and interassay coefficients of variation for the assay were 5.2 and 2.5%, respectively.

Means were compared by analysis of variance. A p value of < 0.05 represented a significant difference between two means.

## Results

Mean gestational age was similar in the two labour groups, but was one week shorter in the elective caesarean section group (table 1). The duration of labour was similar between vaginally delivered and emergency caesarean section groups. There were no significant differences in birthweight between groups or in the sex distribution of babies. Local epidural blockage was administered to seven mothers in the vaginally delivered group, all mothers in the emergency caesarean section group, and 11 mothers in the elective caesarean section group. Two mothers in each caesarean section group also received halothane general anaesthetic. All babies established breathing rapidly following birth and had normal Apgar scores (8-10).

Mean umbilical plasma concentration of prolactin in the two labour groups were significantly higher (p<0.01) than that of the group delivered by elective caesarean section (fig 1).

## Discussion

The results indicate that the process of labour affects the hypothalamic-pituitary axis at birth. Plasma prolactin concentrations were higher in babies born after labour than in those delivered by elective caesarean section. These findings

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Accepted 11 June 1997

Table 1 Mean birthweight, gestational age, duration of labour and sex of infant (Values are means (SEM))

	n	Birthweight (kg)	Gestational age (weeks)	Duration of labour (hours)	Sex	
					Male	Female
Vaginal delivery	7	3.27 (0.25)	38.6 (0.6)	11.4 (2.3)	5	2
Emergency caesarean section	8	3.19 (0.19)	39.0 (0.3)	11.7 (2.0)	3	5
Elective caesarean section	12	3.02 (0.11)	38.0 (0.3)		4	8

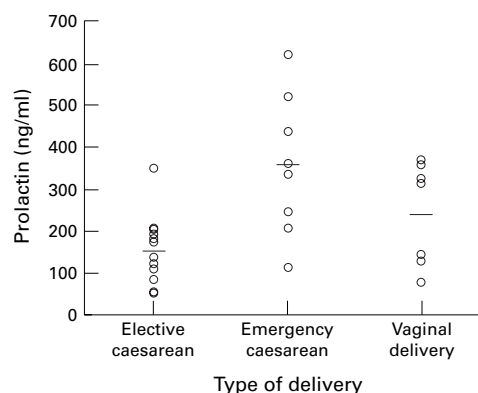


Figure 1 Plasma prolactin concentrations in infants born vaginally or by caesarean section subjected (emergency) or not (elective) to labour. Horizontal lines indicate mean values; each patient is represented by an individual symbol.

suggest that the labour process may act to initiate the *post-partum* surge in prolactin.<sup>3</sup> The exact mechanism by which labour can influence hypothalamic-pituitary function has not been determined, but could be related to the physical stress imposed on the fetus during labour, which it has also been suggested, stimulates cortisol secretion.<sup>9</sup> Results from this study contrast with the effect of labour on plasma thyrotrophin concentrations which are higher in infants delivered by caesarean section who have not undergone labour,<sup>9</sup> indicating a divergence in pituitary responsiveness at birth. The extent to which a one week shorter gestation, in conjunction with lower plasma cortisol concentrations<sup>9</sup> may have contributed to reduced prolactin concentrations in infants born by caesarean section who had not undergone labour remains to be established. It should be noted, however, that the influence of gestational age on plasma prolactin concentration is much reduced after 34 weeks of gestation.<sup>10</sup>

The observation of lower plasma prolactin concentrations in infants delivered by elective caesarean section may be of greater clinical importance than the previously reported differences in plasma thyroid hormones and catecholamines between vaginally and caesarean section delivered infants.<sup>9</sup> In particular, prolactin has been implicated in lung maturation,<sup>11</sup> and an abundance of mRNA for both the short and long forms of prolactin receptor has been observed in fetal sheep perirenal adipose tissue.<sup>12</sup> Prolactin could therefore regulate many of the adaptations in both lung and brown adipose tissue that are required to ensure survival after birth. The risk of respiratory morbidity in infants is increased by caesarean section, particularly if performed before 39 weeks of gestation.<sup>13</sup> Infants and lambs also have lower body temperatures when delivered by caesarean section which is due in part to a reduction in non-shivering thermogenesis in brown adipose tissue.<sup>8</sup> The clinical

importance of reduced plasma prolactin concentrations would be further increased for infants born prematurely.<sup>3</sup> In view of the disappointing results from maternal thyrotrophin releasing hormone treatment on neonatal adaptation<sup>14</sup> it may be feasible to modify the dose, to promote prolactin rather than thyrotrophin secretion, given the greater responsiveness of prolactin to this treatment.<sup>15</sup> This could be important when combined with maternal dexamethasone treatment, because although prolactin alone has yet to be shown to have any positive effects on lung maturation, for example, it can act synergistically with a combination of cortisol and triiodothyronine.<sup>16</sup>

In conclusion, our study has shown that the labour process increases circulating plasma prolactin concentrations at birth, and this should be taken into account when attempting to determine the influence of both gestational age and size at birth on prolactin concentration.

This work was funded by The Wellcome Trust. Lindsay Heasman was supported by a Ministry of Agriculture Fisheries and Food Studentship.

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*Arch Dis Child Fetal Neonatal Ed* 1997 77: F237-F238

doi: 10.1136/fn.77.3.F237

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