

Caf 3, Rhône-Poulenc, Paris), of height 6 mm, internal diameter 10 mm, and external diameter 20 mm. The suction area is 0.98 cm<sup>2</sup>, area of contact 1.37 cm<sup>2</sup>, and weight 0.8 g. The Po<sub>2</sub>-electrode measuring 5 mm in height and 10 mm in diameter is inserted in the ring. Fixation of the ring to the fetal scalp is completed by applying a negative pressure of 50–100 mmHg.

The ring was tested on 5 fetuses in vertex position during labour. Its application was possible from 2 cm dilatation. Testing time varied from 2 to 8 hours during the first stage, and from 15 to 45 minutes during the second stage of labour. In all cases the ring stayed in place. Owing to its very small weight and size, the ring causes only minimal skin traction. After removal, slight transient hyperaemia of the skin was observed.

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## Upper airway resistance

Sir,

We are interested in the paper by Purcell (*Archives*, 1976, 51, 602) on the response of the newborn to raised upper airway resistance, and while accepting the general validity of his conclusion concerning behaviour responses, we are somewhat perturbed by his numerical data. An almost identical experiment, conducted to measure nasal resistance in infancy, was reported by Lacourt and Polgar (1971) who pointed out that the equation governing total pulmonary resistance ( $R_{\text{total}}$ ) is:

$$R_{\text{total}} = R_{\text{airway}}^{\text{lower}} + \left( \frac{R_{\text{nostril}}^{\text{small}} \times R_{\text{nostril}}^{\text{large}}}{R_{\text{nostril}}^{\text{small}} + R_{\text{nostril}}^{\text{large}}} \right)$$

Applying this equation to Purcell's data from his text,  $R$  (lower airway) is a *negative* value of  $-20$  cm H<sub>2</sub>O/l per second and applying it to the data in his Table, assuming equal nasal resistances, we again calculate a negative value of  $-54$  and  $-71$  cm H<sub>2</sub>O/l per second for the two sleep states. Lacourt and Polgar calculated a much more likely value of  $+17.9$  cm H<sub>2</sub>O/l per second and much lower nasal resistances. Clearly a negative lower airway resistance is impossible and we can only speculate that there was some technical error in Purcell's otherwise interesting study. Our own experience, and that of others, is that measurement of total pulmonary resistance using the oesophageal balloon technique is very unreliable, especially in the supine infant as studied by Purcell.

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## Reference

Lacourt, G., and Polgar, G. (1971). Interaction between nasal and pulmonary resistance in newborn infants. *Journal of Applied Physiology*, 30, 870–873.

## Dr. Purcell comments:

The method of raising airways resistance used, placing a finger on alternate nostrils, makes movement of the soft nasal septum of the newborn almost inevitable with some obstruction of the opposite nostril as well. This would exaggerate the contribution of the nostrils to the total airways resistance and the formula used by Lacourt and Polgar is not applicable. The technique was chosen as a simple way of raising the airways resistance to assess the respiratory response. Lacourt and Polgar in their study of the nasal airway were at pains to avoid any deflection of the septum, occluding the nostrils with a plug of cotton wool soaked in silicone lubricant. (Their infants were also supine and intrathoracic pressure was measured with an oesophageal balloon.)

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## Plasma aldosterone levels in bottle-fed infants

Sir,

In a recent paper, plasma aldosterone levels on day 6 of life were found to be higher in bottle-fed infants than in those breast fed, though there was no difference in the mean values in cord blood (Dillon *et al.*, 1976). The authors were unable to account for their finding, but there are several differences between breast milk and Cow & Gate Babymilk Plus, the formula given to the bottle-fed infants, which could be responsible (Table).

While the sodium content of Babymilk Plus is similar to that of mature breast milk (Macie, 1949), it is considerably lower than the values obtained for colostrum and transitional milk in this laboratory. Colostrum (days 1–3) was found to have a mean sodium concentration of 23.75 mEq/l (23.75 mmol/l) and a mean potassium concentration of 18.5 mEq/l (18.5 mmol/l), which fell by the sixth day post partum to 17 mEq/l and 16.78 mEq/l respectively (Ansell *et al.*, 1976). By day 6 of life a breast-fed infant will have had a greater total sodium intake than an infant fed on Babymilk Plus from birth, and it may be argued that the bottle-fed infants had a relative deficiency of sodium and thus a greater stimulus to the aldosterone sodium-conserving mechanism than the breast-fed infants.

The difference in pH between Cow & Gate Babymilk Plus and breast milk is considerable (Table). It has been shown that breast-fed infants excrete fewer hydrogen ions