

Breastfeeding and neurological status

SIR—Lanting and colleagues (Nov 12, p 1319) report a “small advantageous effect of breastfeeding on neurological status at 9 years of age”. They suggest that this effect is caused by longer-chain polyunsaturated fatty acids in breastmilk that are absent from most formula milks. We draw attention to an important confounding factor—maternal smoking during pregnancy.

Research in animals has shown several effects on structure and function of the central nervous system of offspring of nicotine-exposed pregnant females. This work suggested substantial effects on noradrenergic and dopaminergic functioning in several brain structures (cerebellum, nucleus accumbens, striatum, ventral tegmental area, substantia nigra) and concomitant behavioural effects (such as hyperactivity). The findings in animals are compatible with those in children of mothers who smoked during pregnancy: more problem behaviour,¹ poorer language development,² and delayed general cognitive development.³ If there is an association between maternal smoking during pregnancy and not breastfeeding, then the effects Lanting and colleagues report can (at least partly) be ascribed to maternal smoking.

We have looked for an association between maternal smoking during pregnancy and breastfeeding afterwards in a group of 1331 mothers of twins from the Netherlands Twin Register.⁴ Maternal smoking during pregnancy (recoded as yes and no) and breastfeeding (6 categories recoded into never and at least for 2 weeks) were assessed 3–6 months after birth (smoking) and 2 years after birth of the twins (breastfeeding). The table shows the cross-tabulated frequencies of smoking and breastfeeding:

| | Non-smoking | Smoking | Total |
|--------|-------------|------------|-------|
| Bottle | 453 (61 %) | 291 (39 %) | 744 |
| Breast | 426 (73 %) | 161 (27 %) | 587 |
| Total | 879 | 452 | |

The association is highly significant (χ^2 test $p < 0.0001$), indicating that 39% of mothers who bottle fed their children smoked, whereas 27% of mothers who breastfed their children smoked during pregnancy.

Socioeconomic status (SES) could be a mediating factor in the feeding-smoking association, since in our data the frequency of maternal smoking shows a significant decreasing trend with increasing SES (in three categories based on occupation of father): in the lowest SES category 43% of women smoked during pregnancy, in the middle category 34%, and in the highest SES group 24% did so. The frequency of breastfeeding rises with increasing SES, from 34% at the lowest SES to 43% at the middle and 50% at the highest SES. However, the smoking-feeding association is present within each SES group ($p = 0.07$, $p = 0.11$, and $p = 0.001$, in the lowest, middle, and highest group, respectively).

The relation between bottle feeding and smoking during pregnancy points to the possibility that part of the association between formula-feeding and neurological status at age 9 is mediated by smoking behaviour of the mother. The observations on nicotine exposure in animals suggest a mechanism by which smoking during pregnancy could influence neurological outcome.

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Authors' reply

SIR—Orlebeke and colleagues suggest that maternal smoking during pregnancy could have introduced a bias in our investigation of the association between breastfeeding and neurological condition at 9 years of age. They report that significantly more mothers who bottle-fed their babies had smoked during pregnancy.¹ The relation between smoking habit and child development is an important issue. It is part of the great public concern about the effect of environmental exposure to toxic substances (see, for example, Gladen,² and Huisman³ and their colleagues). In our study maternal smoking behaviour during pregnancy was included in the obstetric optimum score. We examined the need not only for adjustment for this score, but also for some of its components. The inclusion of maternal smoking in the final logistic regression model did not change the odds ratio with respect to feeding mode (0.56, instead of the reported 0.54) or significantly improve the model fit ($p = 0.35$). Therefore, our finding of a beneficial effect of breastfeeding is not likely to be an artifact caused by maternal smoking.

There are two facts that explain the negligible contribution of maternal smoking to neurological condition. First, the frequency of smoking during pregnancy was similar among formula-feeding mothers and among women who breastfed their infants (60% vs 54%; $p = 0.20$). Second, both neonatal neurological diagnosis and maternal education were included in the model. These variables are related to maternal smoking behaviour ($p = 0.03$ and $p < 0.01$, respectively). Thus, the assumption of a beneficial effect of breastfeeding on long-term neurological development is maintained.

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Migration of *Echinococcus granulosus* via lymphatics

SIR—On the goldfields of South Africa, mine workers are screened for occupational lung disease and during a 30-month period the Anglo American Corporation programme in Welkom detected 34 hydatid cysts of the lung in 29 patients from about 284 000 miniradiographs (nearly 85 000 workers). In these 29 cases, ultrasound of the liver failed to show any other cysts. I found this disconcerting since the accepted mode of spread of *Echinococcus granulosus* from the jejunum is via the portal system to the liver and although the onchosphere can undoubtedly traverse capillary beds, the liver was bypassed very frequently.