

LETTERS TO THE EDITOR

Weight gain and relation to maternal smoking

EDITOR,—I would like to comment on the article "Weight gain during the first year of life in relation to maternal smoking and breast feeding in Norway".¹ In 1994 we published a similar study in the *American Journal of Epidemiology*.² We found that infants of mothers who breast fed at least three months and who smoked at least one of those months were not only heavier, but had higher body mass and ponderal index at one year of age than infants of non-smoking mothers who breast fed (at least three months). We also considered length of lactation and found, as Nafstad and colleagues did, that it failed to account for the entire differential. The finding held even when we restricted to women who nursed the entire year.

Why should this be? Professor Jean Golding of the University of Bristol, England, and her staff suggested an interesting explanation. Perhaps "smokers, who reportedly have more difficulty maintaining milk supply... provided more solid food to make up for the sparse breast milk, thus increasing the infant's weight and body mass. As milk supply decreased, the infant would also get less nicotine; perhaps the infant was fussy from withdrawal as well as hunger and the mother gave more solid food as she sought ways to soothe the child". We suggest other explanations in our article, including the changed taste and smell of breast milk and the infant's response to it.

Thank you for your work in this interesting and understudied field of infant nutrition.

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- 1 Nafstad P, Jaakkola JJK, Hagen JA, *et al.* Weight gain during the first year of life in relation to maternal smoking and breast feeding in Norway. *J Epidemiol Community Health* 1997; 51:261-5.
- 2 Little RE, Lambert MD, Worthington-Roberts B, *et al.* Maternal smoking during lactation: relation to infant size at one year of age. *Am J Epidemiol* 1994;140:544-54.

Reply

We read with great interest Dr Little's comparison of her group's results from Seattle¹ with our findings from Oslo.² We observed in agreement with previous studies that smoking during pregnancy reduces birth weight³ and that children of smokers catch up the body weight by the age of 12 months.⁴ As a new finding we observed that part of the catch up is explained by the shorter duration of breast feeding in smokers than non-smokers. We also demonstrated that the duration of breast feeding is inversely related to the weight gain. In the Seattle study, the children of smoking mothers, both breast fed (n=74, 10 270 g) and bottle fed (n=64, 10 150 g), were considerably heavier at one year of age than breast fed children of non-smokers (n=195, 9970 g), and the breast fed children of smokers had a greater body mass (16.7, 16.4, 16.2) and ponderal indices (2.13, 2.08, 2.08). In her letter Dr Little points out that these differences remained even in children breast fed for 12 months or more.

We reanalysed our data to verify Dr Little's findings (table 1). The parameters of growth were stratified by maternal smoking at the end of pregnancy and by breast feeding either at the age of 6 or 12 months. The stratified analysis does not take fully into account the differences in duration of breast feeding between smokers and non-smokers. The children with the longest duration of breast feeding and non-smoking mothers have the slowest weight gain (n=6, 317 g/y) and the lowest average weight at one year of age (n=9, 934 g) and the children with the shortest duration of breast feeding and smoking mothers have the fastest weight gain (6785 g/y) and highest mean one year body weight (10 222 g). When looking at children breast fed for at least six months, the average one

year body weight in children of smokers is slightly greater (10 079 g) than in children of non-smokers (10 006 g) showing that children of smokers had caught up in body weight. When focusing on breast feeding at 12 months of age, our results are consistent with those of Dr Little and colleagues: the average one year body weight in the children of smokers (10 112 g) is higher than in children of non-smokers (9934 g), but the difference is not significant (p=0.26, Student's *t* test). The highest mean one year body weight (10 155 g) was also here seen among children of smokers with the shorter period of breast feeding (less than 12 months). This observation does not support the hypothesis that components of tobacco smoke in breast milk increase the weight gain.

The catch up in body weight in children of smoking mothers is partly explained by shorter duration of breast feeding, which may be determined both physiologically and to different physical and social environments, or both, between children of smokers and non-smokers. Currently, it is impossible to say which is more important: the content of breast milk or the quality of supplement nutrition. However, there seems to be some other unknown factors that are not related to the duration of breast feeding that cause faster weight gain in children whose fetal growth has been reduced by mother smoking. Again both physiological factors, for example, some developmental regulation and/or environmental factors may explain the phenomenon.

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- 1 Little RE, Lambert III D, Worthington-Roberts B, *et al.* Maternal smoking during lactation: relation to infant size at one year of age. *Am J Epidemiol* 1994;140:544-54.
- 2 Nafstad P, Jaakkola JJK, Hagen JA, *et al.* Weight gain during the first year of life in relation to maternal smoking and breast feeding in Norway. *J Epidemiol Community Health* 1997;51: 261-5.
- 3 Kramer MS. Determinants of low birth weight: methodological assessment and meta-analysis. *Bull World Health Organ* 1987;65:663-737.
- 4 Conter V, Cortinovis I, Patrizia R, *et al.* Weight gain in infants born to mothers who smoked during pregnancy. *BMJ* 1995;310:768-71.

Table 1 Indicators of growth during first year of life by maternal smoking at the end of pregnancy and breast feeding status at 6 and 12 months after delivery for 3020 children of the Oslo Birth Cohort 1992-93

	no		yes		no		yes	
	breast feeding at 6 months		(n=372)		(n=568)		(n=340)	
Maternal smoking:	no		yes		no		yes	
Weight gain (g) first year of life	6378	1043	6572	1113	6830	1048	6785	1046
Weight (g) at one year of age	10 006	1136	10 079	1213	10 211	1131	10 222	1121
Body mass index at one year of age	17.3	2.2	17.3	1.5	17.3	1.6	17.6	2.0
Maternal smoking:	no		yes		no		yes	
breast feeding at 12 months	yes		yes		no		no	
Weight gain (g) first year of life	6317	1069	6573	1150	6493	1037	6695	1072
Weight (g) at one year of age	9934	1154	10 112	1232	10 109	1127	10 155	1159
Body mass index at one year of age	17.3	2.3	17.4	1.7	17.3	2.0	17.4	1.8

Missing information on height at one year (20 children) reduces the number of children included in the estimation of body mass index (kg/m²).