Human milk composition: effect of premature birth and milk volume

Dear Sir:

The recent article by Anderson et al (1) arrives at the conclusion that previous reports of nutrient differences in milk composition of mothers giving birth at term and prematurely are in error due to failure to consider milk volume. Unfortunately their conclusion arises in part from an inadequate consideration of previous literature in which this point has been considered thoroughly.

In our first report (2), which was the first to observe the higher nitrogen composition of preterm compared to term milk our analysis was identical to that performed by Anderson et al (1). This was because we also found a volume effect. However, the adjusted values obtained by covariance analysis to correct for effect of day and volume over the first day of lactation were only slightly different from the unadjusted (Table 1). In contrast, volume had no effect on the macromineral composition, including Na, Cl, K, Mg, Ca, and P (3). Similarly, we reported no association between volume and lipid, or lactose concentration even though total fat was higher, while lactose concentration was lower in preterm than full-term milk (4). We were very aware of this issue and have considered it carefully in all of our analyses.

Our failure to obtain a volume effect of significance affecting our conclusion may be related to the much higher volumes of milk we obtained in 24 h from both preterm and full-term mothers. Sometimes we would find a tendency for milk volumes collected from preterm mothers to be less (4) but at other times this was clearly not so (5) compared to term mothers. On days 3 to 5 the mean volumes we obtained (2, 4, 5) were nearly twice that obtained by Anderson et al (1). This picture was true at 15 to 18 days for the preterm mothers, although by this time the volumes of milk obtained from the term mothers in both studies were identical. Perhaps if very low volumes of milk are obtained this becomes a primary determinant of composition, and contraindicates a clear perspective on the nutrient composition of preterm milk.

TABLE 1
Comparison of mean nitrogen (N) concentration in milk from mothers of premature (PT) and full-term (FT) infants; adjusted values were obtained by covariance analysis to correct for effect of day and volume (from 2)

<table>
<thead>
<tr>
<th>Milk group</th>
<th>n</th>
<th>N concentration (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Observed</td>
<td>Adjusted*</td>
</tr>
<tr>
<td>FT</td>
<td>27</td>
<td>260.6 ± 8.9†</td>
</tr>
<tr>
<td>PT</td>
<td>42</td>
<td>315.5 ± 8.4</td>
</tr>
<tr>
<td>FT vs PT</td>
<td>p &lt; 0.001</td>
<td>p &lt; 0.001</td>
</tr>
</tbody>
</table>

* N adj = N-day error-volume error.
† Mean ± SE.

These authors have also misinterpreted our sample base. They imply that we pooled a 3-day sample from a mother. This is not true, and as is clear in all of the figures in our publications (2, 4) we report individual data from the specific day of collection. For all mothers we did not attempt to make the collection fall on the same day but set a range. Therefore, the mothers had an option of giving us a complete collection of any 1 day. For example we would accept a sample collected on any 1 day of days 3 to 5 as colostrum. The specific day was entered in the statistical analysis of the effect of volume and day (2–5).

In the design of studies comparing preterm with term milk composition I am always surprised to see included samples from mothers giving birth only 2 to 3 wk prematurely. Surely, if one wishes to examine the effect of premature birth on milk composition it would be expected that samples from mothers giving birth 2 to 3 months prematurely should be the sample base. Considering the high variability of milk composition, variability introduced by gestational age should be a logical factor to control. Having failed to do so, the authors (1) might consider correlation analysis of gestational age with composition on each of the collection days. Udipi et al (6) recently reported a negative linear correlation of gestation with nitrogen content of milk collected on specified days early in lactation.

In addition to milk volume, which under normal circumstances in animals is deter-

Reply to letter by Anderson

Dear Sir:

Although it was the report of Atkinson et al (1) that originally described an increased nitrogen concentration in milk from mothers who deliver prematurely, this report also led to additional investigations, some confirming and others refuting their findings (2–5). The expanded purpose of several of these additional investigations was not only to relate the milk protein concentration but also the milk carbohydrate and fat concentrations to the length of the mother’s pregnancy.

The review of previously reported data on milk nutrient composition as related to length of gestation in our discussion (4) is accurate. We will here again elucidate our concerns that 24-h milk volume variation in different studies and the statistical pooling of data over several different days of lactation, particularly within the first 2 wk after delivery, may be reasons for the differing results reported. We welcome this opportunity to elaborate further on the data in our report.

In our study (4) the protein concentration was negatively correlated with 24-h milk volume during the first 2 wk of lactation. This is not a new observation but was previously reported by Hytten (6). Atkinson et al (1) reported a significant difference in the nitrogen content of preterm and term mothers’ milk controlling for both day postpar-