A New Bottle Design Decreases Hypoxemic Episodes during Feeding in Preterm Infants.

Dr. Peter P. W. Weiss

A New Bottle Design Decreases Hypoxemic Episodes during Feeding in Preterm Infants

Dr. Peter P. W. Weiss

Although breastfeeding is clearly best for infants, it may not always be possible. Therefore, the use of a bottle with expressed milk for example may be indicated. However, all bottles are the same. Or are they? Dr. Peter P. W. Weiss looked at an interesting study [1] which suggests that the overall feeding pattern and oxygenation of a new bottle design are closer to the physiologic norm than a standard bottle. He also carried out an interview with the lead author, Dr. Alejandro G. Jenik, Hospital Italiano, Buenos Aires, Argentina.

Feeding barriers facing preterms

Mothers of vulnerable infants, such as preterms, encounter a variety of unique breastfeeding barriers and challenges that may result in a decreased rate of breastfeeding. In these cases, the next “best” alternative is bottle feeding with expressed breast milk. However, the characteristics of many bottle systems vary widely in terms of flow rates achieved, and some may require well-developed sucking capabilities—which may be problematic in premature babies.

Hypothesis adopted in the study

The researchers theorised that use of a new bottle system compared to their hospital’s standard bottle will reduce stress of oxygen desaturation and improve feeding outcome. The new MAM Babyartikel GesmbH bottle (known as “Anti-Colic”) features the ULTIVENT valve and teat, which interact with each other to replicate breastfeeding.

Methods

A total of 34 clinically stable preterm neonates, PCA mean 35.4 weeks (standard deviation SD 1.3), mean birth weight 1663 g (SD 479 g) were chosen as eligible for the study. They were near the time of discharge from the NICU (mean 2.4 days, SD 1.6), were not receiving oxygen, and were exclusively oral-feeding 100% of their daily milk intake.

Two types of bottles were used in the study: Standard Hospital bottle—straight and cylindrical in shape, without valve and vents and with a traditional bottle teat shape. Vacuum builds up within the bottle as an infant withdraws milk. As feed progresses, this negative pressure increases, opposing the suction exerted by the infant. This situation leads to difficulty in generating suction and/or results in a decrease in the milk flow rate.

The newly designed teat mimics mom's breast in shape and feel. The teat contains internal rib structures to encourage “stripping” action and eliminates teat collapse. The silky textured area replicates the soft skin of the mother's breast. The broad bulge of the teat allows sufficient space for the lips to latch on, so the baby can uninterruptedly feed without swallowing air.

The main outcome was the occurrence, severity, and pattern of oxygen desaturation. Clinically significant desaturation events considered are shown in Table 1. SpO2 was recorded continuously via an oximeter probe placed on the infants’ foot. The secondary outcome was a comparison of the oral feeding efficiency (total volume...
transferred minus volume lost during feeding divided by the feeding time during the use of the two systems of bottle feeding and percent milk leakage or loss (by weighing a bib before and after each feeding an increase of 1 g = 1 mL of loss) over the total volume of milk removed from the bottle.

**Discussion**

Previous studies have consistently demonstrated that breastfed babies have higher oxygen saturation than bottlefed babies. Indeed, studies have shown that there is less ventilatory disruption during breast-feeding compared with bottle feeding, which may result in higher oxygen saturation [2]. Infants with lower oxygen saturation tend to have shorter sucking bursts, potentially signifying less energy available for sucking. They also tend to organize restorative breathing between sucking bursts poorly, engaging instead, in shorter intervals between sucking bursts [3]. The current study confirms that preterm infants continue to have frequent oxygen desaturation events during bottle feeding near the time of discharge from the NICU.

However the authors show that preterm infants showed less desaturation events during the feeding process with the new design bottle which prevents a high buildup of internal vacuum.

Adequate oxygenation enables infants to maintain behavioural organization [4]. Lower oxygen saturation during feeding impacts the infant’s ability to organize and maintain oral feeding skills. The low oxygen saturation observed in the infants when they were fed with the standard bottle explains the poorer feeding outcomes as compared to infants fed with the new design bottle.

The results of this interesting research suggests that indeed not all bottles are the same and that the overall feeding pattern and oxygenation of the new model design bottle are closer to the physiologic norm than the standard bottle.

**Results**

Desaturations Events: Baseline SpO2 was within a clinically acceptable range. Preterm infants who are normally oxygenated in room air have significant desaturation during bottle feeding. However, taking into account all the desaturation variables, the SpO2 during feeding was significantly higher in infants fed with the new bottle design compared with the standard bottle.

Oral Feeding Outcomes: Rate of milk transfer was statistically different between the two bottle teats. Rate of milk transfer (Fig. 2) was significantly less with the standard bottle than with the new bottle design (5.0 ± 2.2 Versus 6.9 ± 2.6 ml/min, resp., P < 0.0001). Percent milk loss (Fig. 3) decreased with the new bottle design when compared to the standard bottle (3.5 ± 4.3 Versus. 5.4 ± 5.6%, resp., P < 0.0001). Oral feeding outcomes as compared to infants fed with the new design bottle.

**Table 1: Oxygen desaturation events, expressed as median and (interquartile range)**

<table>
<thead>
<tr>
<th></th>
<th>Standard bottle</th>
<th>New bottle design</th>
<th>P*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of feeding time SpO2 &lt;90%</td>
<td>8% (3–13)</td>
<td>5% (2–11)</td>
<td>&lt;0.004</td>
</tr>
<tr>
<td>Percentage of feeding time SpO2 90%–94%</td>
<td>13% (6–21)</td>
<td>8% (2–18)</td>
<td>&lt;0.0007</td>
</tr>
<tr>
<td>Number of desaturation events per infant</td>
<td>10 (1–19)</td>
<td>4 (1–8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Time with SpO2 &lt;90% (s)</td>
<td>46 s (8.3–150)</td>
<td>30 s (6–96)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mean SpO2 during feeding</td>
<td>94 (91–96)</td>
<td>96 (93–98)</td>
<td>&lt;0.0008</td>
</tr>
</tbody>
</table>

*Wilcoxon signed-rank test.

**Literature:**

4. Purges SW, Bull of the Nat Center for Clin Infant Programs, 1993, (14), 12–16
The innovative base vent of the Anti-Colic equalizes pressure differences and provides an exceptionally even drinking flow. A recent study shows: Colic symptoms are significantly reduced.

Colic in infants caused by an irregular drinking flow and air swallowing can be significantly improved with the help of a ventilated baby bottle:

The vent compensates for pressure differences inside the bottle, allowing for an even drinking flow. MAM has developed a bottle with a patented valve system in collaboration with physicians, technicians, and designers: Whereas the vent in conventional bottles is usually in the teat, the innovative system in the Anti-Colic is different—the ventilation is in the base of the bottle. The large base vent on the Anti-Colic is sensitive and perfectly equalizes pressure differences. It provides an even drinking flow because it reacts faster and more effectively than a small, teat integrated vent. The MAM patent was developed in collaboration with paediatricians and its effect is scientifically proven.

Scientifically proven: MAM Anti-Colic reduces colic complaints

A research team led by paediatrician Dr. Reinhold Kerbl studied which effect the Anti-Colic had on infant colic. 73 infants with colic symptoms (average age: 7 weeks) were included in a medical study. They were fed using the base vented Anti-Colic bottle for the entire duration of the study. The effect on the frequency and duration of colic attacks was observed. The evaluation of interviews and a multivariate analysis including variables such as age, gender and duration of colic showed that the Anti-Colic significantly reduces colic symptoms. "Our results suggest that swallowing air and the type of baby bottle used do have an influence on the frequency of infant colic", says Dr. Kerbl.

In comparison: The MAM Anti-Colic ensures an even drinking flow

The study by paediatrician Dr. Reinhold Kerbl confirms the effect of the Anti-Colic. Paediatrician Dr. Karl Zwiener is also convinced: "With the Anti-Colic babies rarely need to interrupt drinking. The combination of the vented base and soft teat ensure a smooth, even flow."

Dr. Raphael Schnellnegger, who conducted a comparison test of different ventilated bottles, explains: "Our study shows the differences between regular and base ventilated bottles. The drinking flow with the MAM Anti-Colic is clearly smoother."

Confirmed by consumers: 80% less colic* with the MAM Anti-Colic

In a large scale consumer study, 80% of the 131 mothers surveyed could see a significant reduction or even a complete elimination of colic symptoms in their children. In addition, babies accept the teat on the Anti-Colic bottle right away thanks to the MAM Silk Teat® surface.

MAM innovation: Perfect combination of medicine, design and technology

MAM products are the result of intensive research and interdisciplinary cooperation. Scientists, physicians, clinical specialists, midwives and developmental pedagogues work in the MAM Design Studios along with designers and technical specialists. Together they develop innovative solutions and products.

With the MAM Anti-Colic, a bottle has been developed that meets the highest standards and, on the basis of the latest research results, promotes the healthy development of children.

* Consumer study USA 2010, tested with 131 mothers
** Medical study of 73 infants with colic symptoms, Austria 2011

MAM Breastfeeding range

- Manual Breast Pump
- Storage Solution
- Nipple Shields
- Breast Pads

°All MAM products are made from BPA-free materials

mambaby.com/professionals

Website for medical professionals
Benefit from our worldwide MAM network of research and practice.

Your benefits:
- Extensive Study Databank
- Free Download Center
- MAM Events

Contact:
service4professionals@mambaby.com