



Nipple Flow Rates: What are they *really* and how does this affect our clinical practice?

Lee Ann Damian, MA, CCC-SLP (damianl@childrensdayton.org) and Kaitlyn Johnson, MA, CCC-SLP (johnsonk5@childrensdayton.org)
Dayton Children's Hospital, Dayton, Ohio

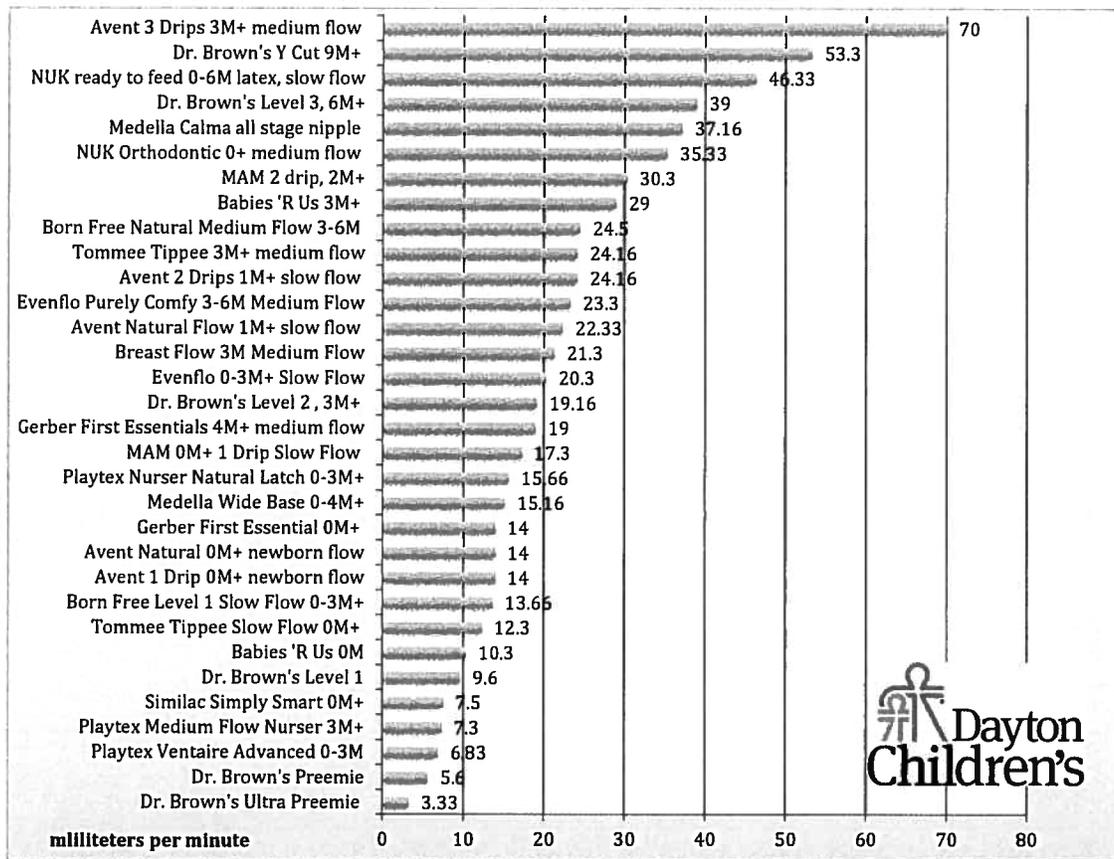
Introduction

Due to the FDA recommendations that were stated in late 2012 regarding the use of commercial thickeners (primarily Simply Thick) in infants; we were forced to re-think and re-assess our current practice of thickening infant's liquids for improvement of swallow function based on these recommendations. As a result, use of slow flow nipples became popular to decrease flow rate with the hope of improving swallow function. It soon became apparent that "slow flow" was not consistent especially according to commercial packaging. This conclusion brought us to repeat and expand on the research of Kelly Jackman, MPT who published research on nipple flow rates in 2013 in the *Newborn and Infant Reviews* 13 (2013) 31-34. We chose to repeat the study with some minor adaptations to determine if there was consistency of correlation between methods. This information will provide an evidence based practice approach to nipple selection for slowing of rate to facilitate safe and efficient feeding. The information gained from the study was used to educate therapists, medical staff, nursing, and parents to aide in appropriate nipple selection based on flow rate and what is commercially available.

Method and Materials

A Symphony Breast pump by Medela, and a Medela disposable personal pumping kit were used. Nipples were placed in a pump flange that best fit the nipple (the 24 ml flange for narrow based nipples and the 27 ml flange for wider based nipple). Each nipple was manually held in the flange to assure a good seal and appropriate suction. Nipples were held upside down to mimic the "old" way of observing nipple "drip" rates. The nipples were manually filled with Similac Expert Care Neosure 22 cal/oz formula at room temperature via a syringe in order to keep the nipple constantly full. This was done simultaneously with the Symphony breast pump in its Expression Phase with 150 mm Hg of suction. Liquid was collected in Medela breast milk storage bottles. Nipples were tested in this manner three times each. An average milliliter per minute was calculated. If suction was lost or the nipple seal on the flange was broken, the trial was repeated. A Similac Standard Disposable (clear ring), Enfamil Slow Flow (green ring), Similac Slow Flow (yellow ring), and Enfamil Standard Flow Soft Nipple (blue ring) were tested in a similar manner. However, three of each nipple were tested (different lot numbers and expirations dates) for three times each to assess not only the flow rate but the consistency across lots. Nipples were labeled 1, 3, and 3 and were tested three times. The data from each nipple was averaged per trial and then an average was calculated.

Commercial Nipple Flow Rates



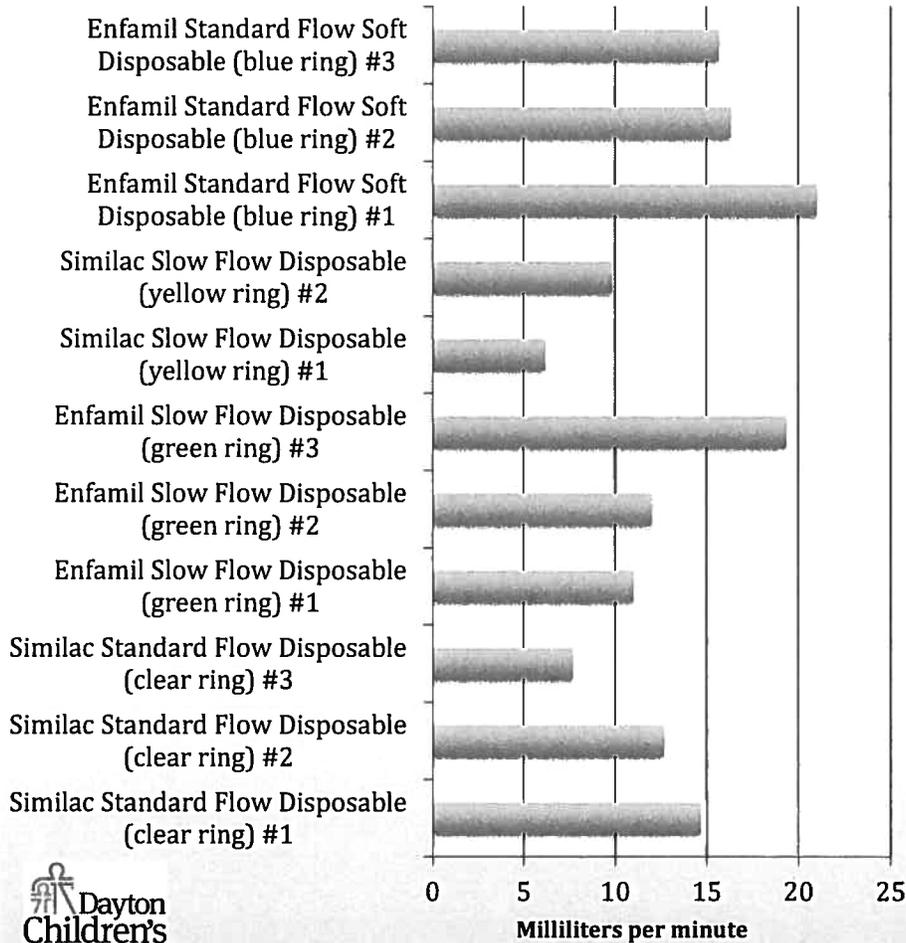
Conclusion:

- Nipples advertised as “slow flow” can range from flow rates of 5.6 ml per minute to 46.3 ml per minutes.
- Disposable hospital nipples have more variation in flow rates from each unit than commercial nipples. Flow rates of disposable nipples also have variation with repeated use.
- Flow rates of commercially available nipples were more consistent with multiple trials.
- Further research is warranted in the future to measure pliability of nipples and its affect on flow rate.
- Clinically, both pliability and flow rate of the nipple should be considered when determining an appropriate nipple for an infant.

Application

- Knowledge of flow rates of disposable hospital nipples can help determine an appropriate “home going” nipple with similar flow rate.
- Nipple flow rate information can help your hospital determine when nipples to stock in the medical imaging room where modified barium swallow studies are performed. Having more options for changing the flow rate during a swallow study may decrease the need for a thickening agent.
- Evidence of nipple flow rates is beneficial for parent and staff education on an appropriate feeding system.
- Flow rate data has improved parent and staff acceptance of the recommended feeding system.
- Commercial marketing and packaging changes frequently and unexpectedly.

Disposable Nipple Flow Rates



References

- Jackman, K.** Go with the Flow: Choosing a feeding system for infants in the neonatal intensive care unit and beyond based on flow performance. *Newborn and Infant Nursing Reviews*. 2013; 13: 31-34.
- Rose M.** Clinical research trial of bottle nipples: choosing the best nipple for the individual neonate. *Nursing Currents*. 2011; 5: 10-15.
- Fadavi S, Punwani, IC, Jain, L, Vidyasagar D.** Mechanics and energetics of nutritive sucking: a functional comparison of commercially available nipples. *Journal of Pediatrics*. 1997 May; 130 (5): 740-5.
- Scheel CE, Schanler RJ, Lau C.** Does the choice of bottle nipple affect the oral feeding performance of very-low birth weight infants. *Acta Paediatr*. 2005; 94: 1266.
- Schrank W, Al-Sayed LE, Beahm PH, Thach BT.** Feeding responses to free-flow formula in term and preterm infants. *Journal of Pediatrics*. 1998 Mar; 132 (3 Pt 1): 426-30.
- Mathew, OP.** Breathing patterns of preterm infants during bottle feeding: role of milk flow. *Journal of Pediatrics*. 1991 Dec; 119 (6): 960-5.
- Mathew OP, Belan M, Thoppil CK.** Sucking patterns of neonates during bottle feeding: a comparison of nipple units. *American Journal of Perinatology*. 1992 Jul; 9 (4): 265-9.
- Mathew OP,** Nipple units for newborn Infants: a functional comparison. *Pediatrics*. 1988 May; 81 (5): 688-91.
- Chang VJ, Lin CP, Lin VJ, Lin CH.** Effects of single-hole and cross-cut nipple units on feeding efficacy and physiological parameters in premature infants. *Journal of Nursing Research*. 2007; 15: 215-222.
- Lau C, Schanler RJ.** Oral feeding in preterm infants: advantage of self-paced milk flow. *Acta Paediatr*. 2000;89: 453-459.
- Walden E, Prendergast J.** Comparison of flow rates of holes versus cross-cut teats for bottle fed babies. *Prof Core Mother Child*. 2000; 10 (1): 7-8.
- Mathew, OP.** Determinants of milk flow through nipple units: role of hole size and nipple thickness. *Am J Dis Child*. 1990; 144(2):222-224.
- Nowak AJ, Smith WL, Erenberg A. Imaging evaluation of breast feeding and bottle feeding systems. *Journal of Pediatrics*. 1995; Jun; 126 (6): 5130-4.
- Kish MZ. Oral feeding readiness in preterm Infants: a concept analysis. *Adv Neonatal Care*. 2013 Aug; 13(4):230-7

