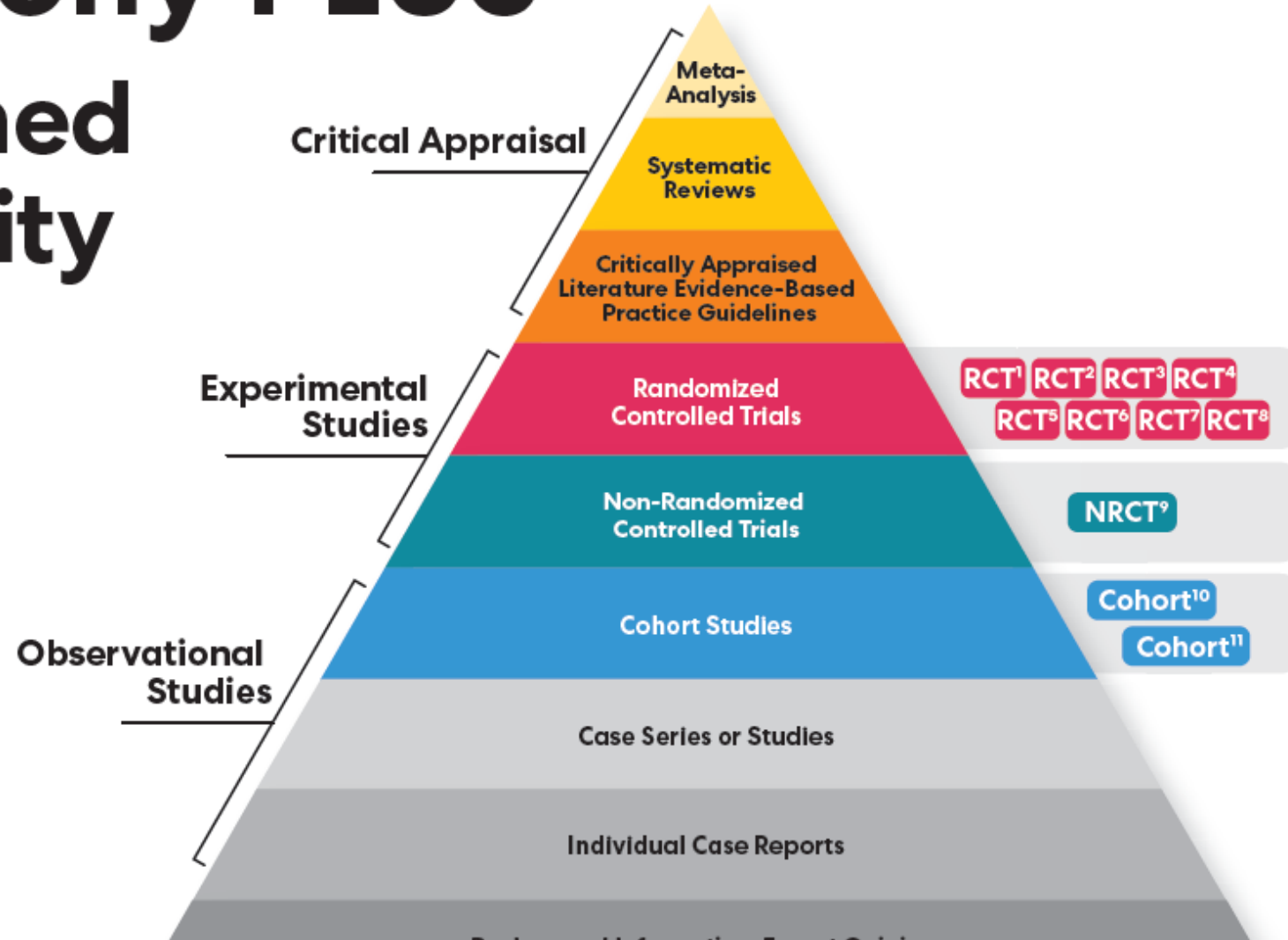


Symphony PLUS®

Unmatched Superiority



1. Meier PP et al. J Perinatol. 2012; 32(2):103–110. 2. Yuan S et al. Breastfeed Med. 2023; 18(7):506–513. 3. Prime DK et al. Breastfeed Med. 2012; 7(6):442–447. 4. Meier PP et al. Breastfeed Med. 2008; 3(3):141–150. 5. Kent JC et al. J Hum Lact. 2003; 19(2):179–86; quiz 87–8, 218. 6. Kent JC et al. Breastfeed Med. 2008; 3(1):11–19. 7. Mitoulas LR et al. J Hum Lact. 2002; 18(4):353–360. 8. Sakalidis VS et al. Acta Obstet Gynecol Scand. 2020; 99(11):1561–1567. 9. Mitoulas LR et al. J Hum Lact. 2002; 18(4):344–352. 10. Post EDM et al. J Perinatol. 2016; 36(1):47–51. 11. Torowicz DL et al. Breastfeed Med. 2015; 10(1):31–37.

The Initiation Technology™ Difference

Using the Symphony PLUS® Initiation Technology doubles the number of mothers ‘Coming to Volume’

What is ‘Coming to Volume’?



Daily milk volume > 500 ml by day 14

- Critical threshold for achieving an adequate milk supply



Why is it important?




Coming to Volume:

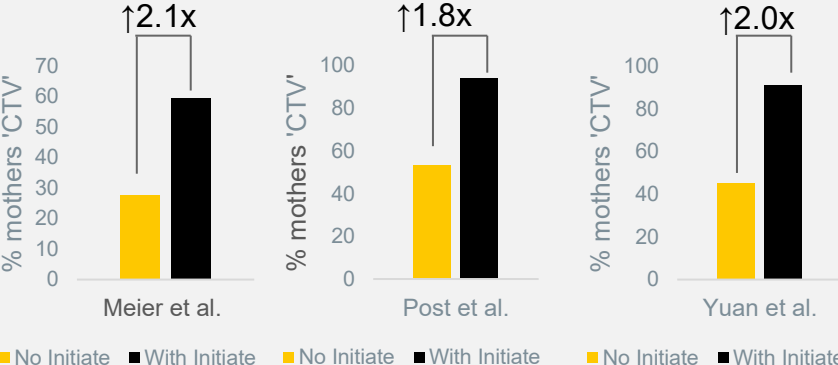
- is the strongest predictor of the provision of Parents own milk feedings at NICU discharge¹
- 9.7 x greater odds of feeding milk of the own mother at discharge¹

→ Increased mothers’ own milk reduces costs in the hospital ²⁻⁶

How does Initiation Technology make an impact?



→ Using a pump with Initiation Technology doubles the number of mothers who ‘Come to Volume’



Study	No Initiate (%)	With Initiate (%)	Impact
Meier et al.	~28	~58	↑2.1x
Post et al.	~55	~95	↑1.8x
Yuan et al.	~45	~90	↑2.0x

¹ Hoban R et al. Breastfeed Med. 2018; 13(2):135–141. ² Johnson TJ et al. Neonatology. 2015; 107(4):271-276. ³ Patel AL et al. J Perinatol. 2013; 33(7):514-519. ⁴ Patel AL et al. Arch Dis Child Fetal Neonatol Ed. 2017; 102 (3):F256-F261. ⁵ Patra K et al. Neonatology. 2017; 112(4):330-336. ⁶ Meier P et al. J Pediatr. 2017; 180: 15-21.

Using the Symphony PLUS[®] pump promotes lactation in mothers who deliver prematurely

Published:
Yuan, RCT,
2023

The Utilization of Sodium Concentration in Human Milk from Pump-Dependent Mothers of Preterm Infants as a Measure of Milk Production. Yuan S, et al. *Breastfeed Med.* 2023.



Participants

- 66 mothers of premature infants delivered from February to December 2018 at a tertiary level hospital.
 - infant gestational age of 28–35 weeks,
 - anticipated NICU stay \pm of 15 days, and
 - mother aged 20–40 years
- Group 1 (23)
- Group 2 (23)
- Group 3 (23)

100% of mothers used Symphony Breast Pump



Protocol

- Randomized controlled study three groups:
 - **Group 1**, a hospital-grade electric breast pump* was used from postpartum day 1 to 14;
 - **Group 2**, a hospital-grade electric breast pump* was used on postpartum days 1 to 5 and a normal personal electric breast pump on postpartum days 6 - 14;
 - **Control group**, a personal normal electric breast pump was used from postpartum day 1 - 14.
- Milk samples taken from both breasts twice a day to measure sodium concentrations

* Hospital grade pump for groups 1&2 commenced with Symphony Plus INITIATION until 3 x 20mls and then switched to MAINTAIN program



Key outcomes

- Average daily volume of MOM was significantly higher in the intervention groups ($p < 0.05$) than in the control group. There was no significant difference between groups 1 and 2.
- It took longer for MOM sodium levels in the control group to normalize than in the intervention group ($p < 0.01$). There was no significant difference between groups 1 and 2.



Conclusions

- In the early stage of lactation initiation (within 5 days postpartum), using a hospital-grade electric breast pump stimulates milk secretion in preterm mothers, and helps the MOM sodium concentration to normalize, which highlights the importance of the type of breast pump for secretory activation.

Symphony PLUS[®] and Breast Shield design can improve milk removal, comfort and the overall pumping experience for women

Breast shield design impacts milk removal dynamics during pumping: A randomized controlled non-inferiority trial.
Sakalidis V, et al. *Acta Obstet Gynecol Scand.* 2020.



Participants

- Mothers (n = 49) of breastfeeding infants participated in the study over two study sessions.



Protocol

- Participants were randomly assigned to pump both breasts simultaneously for 15 minutes with either the 105° or 90° breast shield in the first session, and the other shield in the second session to assess:
 - Effectiveness (breast drainage) and efficiency (volume expressed) of both breast shields were assessed after 15 minutes of pumping.
 - Perceived comfort was assessed via questionnaire.



Key outcomes

- The 105° breast shield was both non-inferior and superior compared to the standard 90° shield for breast drainage positive mean difference 3.87% (0.01-7.72), P = 0.049) and volume expressed positive mean difference 9.14 mL (1.37-16.91), P=0.02).
- The 105° shield was rated as feeling more comfortable (P < 0.001) and as having an improved fit to the breast (P < 0.001) compared to the 90° shield.



Conclusions

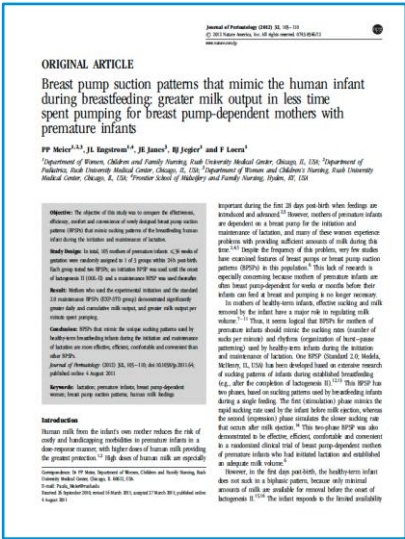
- Expressing with the 105° breast shield was more efficient, effective and comfortable compared to the 90° shield.
- Breast shield design can significantly impact pumping outcomes, and an opening angle of 105° improves both the dynamics and comfort of milk removal.



Symphony PLUS[®] INITIATION Program delivers increased daily milk output

Published:
Meier, RCT,
2012

Breast Pump Suction Patterns that Mimic the Human Infant during Breastfeeding: Greater Milk Output in Less time spent Pumping For Breast Pump-Dependent Mothers with Premature infants. Meier P, et al. *J Perinatol* 2012.



Participants

- 105 breast pump-dependent mothers with infant gestational age ≤ 34 weeks, with anticipated NICU stay of ≥ 15 days, and maternal decision to initiate lactation.

100% of mothers used Symphony Breast Pump

Protocol

- Randomized, blinded clinical study conducted in a Level III NICU in the Midwestern US (Rush Medical Center, Chicago).
- Mothers were blindly assigned to one of three study groups with various breast pumping suction patterns (BPSP) to compare the effectiveness, efficiency, comfort and convenience of combinations of BPSPs that mimic human infant sucking patterns during the immediate post-birth period as well as later in lactation.

Key outcomes

- Mothers who used the **experimental initiation (rapid sucking rate and irregular sucking rhythm)** and the standard maintenance breast pumping suction patterns demonstrated **significantly greater daily and cumulative milk output**, and **greater milk output per minute** spent pumping.

Conclusions

- BPSPs that mimic the unique sucking patterns used by healthy term breastfeeding infants during the initiation and maintenance of lactation are more effective, efficient, comfortable and convenient than other BPSPs.
- Using the INITIATION program followed by the MAINTAIN program yielded more than 50% more milk for premature infants of pump-dependent mothers in the first 14 days than using the MAINTAIN program alone.

Using the Symphony PLUS[®] pump with simultaneous expression improves milk yield with a higher energy content

Published:
Prime, RCT,
2012



Participants

- Healthy Australian breastmilk-feeding mothers (n = 31) of term infants (median age, 19 weeks).
- To be eligible for participation, mothers needed to have an established milk supply and have no concerns about their milk production.
- The mothers in this study were exclusively breastfeeding, breastfeeding and expressing, or exclusively expressing breastmilk.



Protocol

- This study investigated simultaneous (SIM-Both breasts at the same time) breast expression compared with sequential (SEQ-one breast followed by the other) expression, to determine any difference in milk output efficiency and efficacy
- The order of expression type (SIM/SEQ) and breast (left/right) was randomized.



Key outcomes

- SIM expression yielded more milk ejections ($p \leq 0.001$) and greater amounts of milk at 2, 5, and 10 minutes ($p \leq 0.01$) and removed a greater total amount of milk ($p \leq 0.01$) and percentage of available milk ($p < 0.05$) than SEQ expression.
- After SIM expression the cream content of both the overall (8.3% [$p \leq 0.05$]) and post expression (12.6% [$p \leq 0.001$]) milk were greater.



Conclusions

- SIM (both breasts at the same time) expression stimulated more milk ejections and was a more efficient and efficacious method of expression, yielding milk with a higher energy content.

BREASTFEEDING MEDICINE
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DOI: 10.1007/s12119-012-9138-8

Simultaneous Breast Expression in Breastfeeding Women Is More Efficacious Than Sequential Breast Expression

Danielle K. Prime, Catherine P. Garbin, Peter E. Hartmann, and Jacqueline C. Kent

Abstract

Introduction: Simultaneous (SIM) breast expression saves mothers time compared with sequential (SEQ) expression, but it remains unclear whether the two methods differ in milk output efficiency and efficacy. **Subjects and Methods:** The Symphony device (Medela AG, Basel, Switzerland) was used to measure milk output and milk ejection during breast expression (electric pump) in 31 Australian breastfeeding mothers of term infants (median age, 19 weeks) [interquartile range, 16–33 weeks]. The order of expression type (SIM/SEQ) and breast (left/right) was randomized. **Results:** SIM expression yielded more milk ejections ($p < 0.001$) and greater amounts of milk at 2, 5, and 10 minutes ($p < 0.01$) and removed a greater total amount of milk ($p < 0.01$) and percentage of available milk ($p < 0.05$) than SEQ expression. After SIM expression the cream content of both the overall (8.3% [$p < 0.05$]) and postexpression (12.6% [$p < 0.001$]) milk were greater. During SEQ expression, the breast expressed first had a shorter time to 50% and 80% of the total amount of milk than the breast expressed second ($p < 0.05$), but, overall, a similar percentage of available milk was removed from both breasts. **Conclusions:** SIM expression stimulated more milk ejections and was a more efficient and efficacious method of expression, yielding milk with a higher energy content.

Introduction

Interventions to increase a large proportion of breastfeeding mothers are now using breast pumps to express their milk for health issues or convenience. Additionally, concerns about low milk supply are cited in the most common reasons for breastfeeding difficulties, and expressing both breasts postpartum is the recognized management for decreasing milk supply when required.¹ Interventions used across to (1) breast pumps that are efficient, easy to use, and efficient and (2) evidence-based information on how to best express milk with a breast pump. This will allow mothers to make informed decisions when choosing the method of breast expression that is best suited to their situation.

If mothers choose to use an electric breast pump, then they may have the option of expressing milk using the simultaneous (SIM) (both breasts at the same time) or the sequential (SEQ) (one breast followed by the other) technique. Researchers have attempted to understand whether these techniques differ in efficiency and efficacy, with four studies investigating mothers of premature infants^{2–5} and two studies investigating mothers of healthy term infants.^{6,7}

Using the Symphony PLUS[®] pump is more comfortable and equally efficient and effective versus the Classic Medela Pump

Published:
Meier, RCT,
2008



BREASTFEEDING MEDICINE
Volume 3 Number 3 2008
© Mary Ann Liebert, Inc.
DOI: 10.1089/bfm.2007.0021

A Comparison of the Efficiency, Efficacy, Comfort, and Convenience of Two Hospital-Grade Electric Breast Pumps for Mothers of Very Low Birthweight Infants

Paula P. Meier,¹ Janet L. Engstrom,² Nancy M. Hunt,³ Barbara Ackerman,^{4,5} Maureen Allen,² Judy E. Matkovic,¹ Joyce L. Zuker,¹ and Brian J. Jagan¹

Abstract

Objective: Many mothers of very low birthweight infants are breast pump-dependent for weeks or months and need a breast pump that is efficient, effective, comfortable, and convenient. **Study design:** This multicenter, blinded, randomized clinical trial compared the efficiency, efficacy, comfort, and convenience of the Symphony[®] breast pump (Medela, McHenry, IL) (SBP) to the Classic[®] breast pump (Medela) (CBP) and also compared these same outcome measures for single- and multiphase suction patterns used in the SBP. All 100 mothers initiated lactation with the CBP for 7 days and then returned to the SBP for 5 days. All 100 mothers initiated lactation with the SBP for 7 days and then returned to the CBP for 5 days. **Results:** The onset of milk ejection was quicker ($P < 0.05$) for the single- versus multiphase patterns in the SBP, suggesting that mothers had become conditioned to the unphysiologic single-phase pattern in the CBP. However, all other measures of efficiency and efficacy were not significantly different, including milk output at 5-minute intervals. When asked to compare the SBP and the CBP, mothers in Protocol I rated the SBP as significantly more efficient, effective, comfortable, and convenient than the CBP ($P < 0.05$), regardless of the suction pattern in the SBP. Similarly, mothers in Protocol II rated the SBP significantly ($P < 0.05$) more comfortable than the CBP, regardless of the specific pattern in the SBP. **Conclusions:** These findings suggest that the SBP was as efficient and effective as the CBP but was significantly more comfortable to use for pump-dependent mothers of very low birthweight infants.

Introduction

For very low birthweight (VLBW) (<1,500 g) infants, the use of a breast pump is an essential component of care. It provides protection from pneumonia-specific nosocomial infections such as necrotizing enterocolitis (NEC), central line-associated bloodstream infections (CLABSI), and late-onset sepsis (LOS).¹⁻³ In order to protect against these infections, mothers must initiate and maintain lactation with a mechanical breast pump, and many of these women

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Design / Participants

- Multi-site, blinded, randomized clinical trial to compare the efficiency, efficacy, comfort, and convenience of the Symphony[®] breast pump (SBP) to the Classic[®] breast pump (CBP).
- 100 mothers of infants with birthweights <1,250 g and/or gestational age <32 weeks, who chose to provide milk for their infants, across four institutions (Rush University, Texas Children's Hospital, Yale-New Haven Medical Center, and Brigham and Women's Hospital).
- Study sites were chosen specifically for their delivery of evidence-based lactation support services so that extraneous variables known to affect milk output, such as skin-to-skin holding and correct fitting of breast shield sizes, could be standardized across sites.

Protocol

- 100 mothers initiated lactation with the CBP and were randomized to single- and multiphase suction patterns in the SBP when daily milk output was at least 350 mL/day.
- Protocol I (n=35) compared each of three suction patterns in the SBP on two separate occasions (six observations) in the neonatal intensive care unit and used the CBP for all other pumpings.
- Protocol II (n=65) compared single- and multiphase patterns in the SBP for 7 days and then returned to the CBP for 5 days.

Key outcomes

- The onset of milk ejection was quicker ($P < 0.05$) for the single- versus multiphase patterns in the SBP, suggesting that mothers had become conditioned to the unphysiologic single-phase pattern in the CBP.
- All other measures of efficiency and efficacy did not differ significantly between single and multiphase patterns.
- Mothers in Protocol 1 rated the SBP as significantly more efficient, effective, comfortable, and convenient than the CBP ($P < 0.05$), regardless of the suction pattern in the SBP.
- Mothers in Protocol II also rated the SBP significantly ($P < 0.05$) more comfortable than the CBP, regardless of the specific pattern in the SBP.

Conclusions

- The Symphony is proven to be as efficient as the Classic in expressing milk from the breast during established lactation (Table 4, p.147).
- Mothers perceived the Symphony to be more comfortable than the Classic. (Table 6, p.148)
 - This may translate to improved long-term lactation outcomes as mothers may be more inclined to comply with pumping requirements if the pump is perceived as comfortable.
- Mothers prefer multi-phase expression patterns. (p.148)
 - 92 % of mothers in Protocol I chose a multi-phase pattern to use after completion of the study, even though they had all initiated pumping with the Classic.
 - Suggests multiphase patterns are innately more 'natural'.
- The time to milk ejection was slower for mothers using the Symphony. (Table 2, p.146)
 - Since pump-dependent mothers can be conditioned to the pattern of their breastpump, the authors suggest that it may be advantageous to condition them to a multi-phase suction pattern (Symphony) that is more like that of the breastfeeding infant, from the start, in order to transition to successful breastfeeding. This may aid in a quicker milk ejection when the preterm baby begins to breastfeed.

A mother's maximum comfort vacuum strength can enhance milk flow rate and milk yield

Published:
Kent, RCT,
2008

Importance of Vacuum for Breastmilk Expression. Kent JC, et al. *Breastfeed Med.* 2008.



Participants

- Twenty-one breastfeeding mothers and two expressing mothers were recruited (n =23).
- Nineteen of the mothers were exclusively breastfeeding babies less than 6 months old, and two were partially breastfeeding babies aged 7 and 8 months.



Protocol

- Study objective was to determine the effect of the strength of applied vacuum on the flow rate and yield of breastmilk using an electric breast pump.
- During the first visit, the maximum comfortable vacuum was determined for the left breast of each mother.
 - For subsequent visits, this vacuum was used as the 100% vacuum for the individual mother (vacuum A). Expression at 75% of this vacuum was also tested (vacuum B), and the order of testing vacuums A and B was randomized.
 - Mothers expressed their breast milk for 15 minutes using an electric breast pump set at their own maximum comfortable vacuum, and at one to three softer vacuums. Milk yield and flow rate were measured.



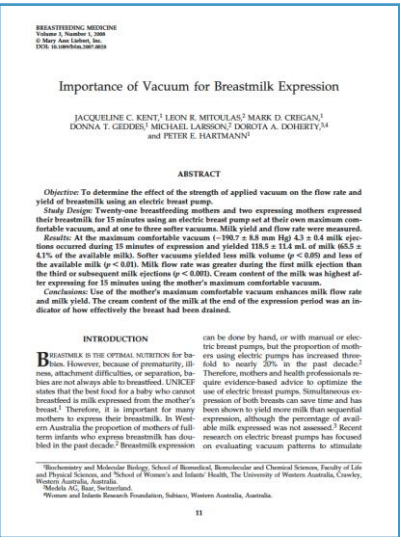
Key outcomes

- At the maximum comfortable vacuum (-190.7 ± 8.8 mm Hg) 4.3 ± 0.4 milk ejections occurred during 15 minutes of expression and yielded 118.5 ± 11.4 mL of milk (65.5 ± 4.1% of the available milk).
- Softer vacuums yielded less milk volume (p <0.05) and less of the available milk (p <0.01).
- Milk flow rate was greater during the first milk ejection than the third or subsequent milk ejections (p <0.001).
- Cream content of the milk was highest after expressing for 15 minutes using the mother's maximum comfortable vacuum.



Conclusions

- Use of the mother's maximum comfortable vacuum enhances milk flow rate and milk yield.
- The cream content of the milk at the end of the expression period was an indicator of how effectively the breast had been drained.



Using the Symphony PLUS[®] pump provides similar breast stimulation patterns as to when an infant first latches

Published:
Kent, RCT,
2003

Response of Breasts to Different Stimulation Patterns of an Electric Breast Pump. Kent JC, et al. *J Hum Lact* 2003.



Participants

- 28 mothers (aged 22-38 years) of healthy, term infants aged between 1 and 6 months, who were members of the Australian Breastfeeding Association or acquaintances of the researchers volunteered to participate.
- All infants were exclusively breastfed on demand.
- Three mothers had no previous experience of breast pumps, others expressed regularly.



Protocol

- This study aimed to assess the effectiveness of different stimulation patterns provided by any electric breast pump.
- Pre-study**
- Mothers measured milk production from each breast for 24 hours and collected samples (≤ 1 mL) from each breast by hand expression immediately before and after each breastfeeding session
- First visit**
- The lactiferous ducts were located using ultrasound, and 1 duct close to the nipple was chosen to be monitored during all subsequent sessions.
- Second and Third visit**
- 7 different stimulation patterns of the breast pump were tested in a predetermined random order.



Key outcomes

- The total 24-hour milk production of the mothers ranged from 372 to 1101g, and the 24-hour milk production of the left breast ranged from 196 to 566 g.
- The time taken for milk ejection to occur in response to the electric breast pump pattern of 45 cycles/min was 147 ± 13 s. For patterns that more closely resemble the sucking frequency of an infant when it first attaches to the breast, milk ejection occurred between 136 ± 12 and 104 ± 10 s, although this difference was not statistically significant.
- The applied vacuum affected the amount of milk that was removed up to 50 to 70 s after milk ejection but not the time for milk ejection.



Conclusions

- The stimulation patterns tested elicited milk ejections similar to those observed during breastfeeding.
- The high frequency stimulation pattern applied by the Symphony breast pump is similar to the rapid sucking of the infant at the beginning of a breastfeed and induces a similar response by the breast.
- The slower frequency patterns took longer to stimulate milk ejection.
- The 45 cpm pattern took 147 s to stimulate milk ejection whereas the high frequency patterns took from 120 - 129 s. However, these numbers are not statistically different due to the high degree of variability observed between mothers.
- The high frequency patterns were perceived to feel more like the baby than the 45 cpm pattern.
- High frequency (>100 cpm) patterns were judged by mothers to feel more like their babies.

Response of Breasts to Different Stimulation Patterns of an Electric Breast Pump

Jacqueline C. Kent, BSc, PhD, Donna T. Ramsay, DMU, PGDip, Dorota Dobrzyn, PhD, Michael Larsson, MBA, Peter K. Hartmann, BSc/Sci, PhD

Abstract

To test the effect on milk ejection, an electric breast pump was programmed to provide pumping patterns with frequencies of 45 or 120 cycles/min and a vacuum of 45 or 175 mmHg. The time taken for milk ejection to occur (measured using ultrasound) to detect a dilation of a lactiferous duct in the opposite breast in response to the current Medela electric breast pump pattern (45 cycles/min) was 147 ± 13 s. For patterns that more closely resemble the sucking frequency of an infant when it first attaches to the breast, milk ejection occurred between 120 and 144 s, although this difference was not statistically significant. Milk ejection in response to breastfeeding occurred after 50 to 70 s. The applied vacuum affected the amount of milk that was removed up to 50 to 70 s after milk ejection but not the time for milk ejection. *J Hum Lact* 19(2):179-186.

Keywords: milk ejection, breast pump, ultrasound, lactiferous duct

Breast milk is the optimal nourishment for infants, and breastfeeding is the most convenient way of providing that nourishment. However, for mothers with premature infants, or those who are unable to breastfeed, or those who are unable to provide enough milk for their infants, the expressed breast milk is the next best option.

Whether breast milk is removed by a breastfed infant or removed manually or by a mechanical or electric breast pump, little milk can be withdrawn unless a milk ejection has occurred. During breastfeeding, milk ejection is triggered by neural impulses from infant sucking stimulating the release of oxytocin from the posterior pituitary gland. Oxytocin causes the contraction of the myoepithelial cells that surround the alveoli in the breasts and results in the expulsion of milk from the alveoli and its flow into the mammary ducts, facilitating the withdrawal of milk from the breast by the infant. Milk ejection also can occur without the physical stimuli of the infant sucking the breast and can be inhibited by stress.

An infant stimulates the milk ejection reflex at the beginning of a feed by sucking rapidly, between 72 and 120 suckles/min, before slowing to 40 suckles/min once milk starts to flow.¹ However, currently available electric breast pumps make no specific provision for the stimulation of the milk ejection reflex. Although the EMS mechanical breast pump (Avent, Glenfield,

J Hum Lact 19(2), 2003
DOI: 10.1177/1043986203250003
© Copyright 2003 International Lactation Consultant Association

Published:
Mitoulas, RCT,
2002b

Effect of Vacuum Profile on Breast Milk Expression Using an Electric Breast Pump. Mitoulas L, et al. *J Hum Lact* 2002.



Protocol

- Mothers (n = 30) of healthy term-delivered infants (1 to 6 months of age) were recruited through either the Australian Breastfeeding Association, Western Australia Branch, or private health care centers.
- Add all infants were exclusively breastfed on demand.

Conclusions

- The authors compared milk expression using 5 experimental vacuum patterns and a commercially available vacuum pattern ranging in cycle times and vacuum curve dynamics using an experimental, software-controlled electric breast pump.
- Milk was expressed from one breast, for 5 minutes after milk ejection occurred and each mother used each of the 6 patterns on the same breast, over 3 separate days (2 per day, 1 day per week over 3 weeks), in a random sequence.
- The degree of fullness of the breast at the first pumping session was used as a guide, and subsequent pumping sessions were required to start at a similar degree of fullness.
- In all cases, a stimulation pattern preceded each expression pattern for each mother.
- The volume of milk removed over 5 minutes differed ($P = 0.0072$) between patterns (range = $62.8 \pm 6.6\text{mL}$ to $47.2 \pm 5.1\text{ mL}$).
- However, there was no difference in the percentage of available milk removed (range = $99.4\% \pm 15.1\%$ to $70.6\% \pm 8.6\%$).
- The rate of milk removal differed between patterns at both the beginning (1 minute) and end (1.5 minutes) of the expression period ($P < 0.05$).
- Peak vacuum chosen differed between patterns ($P = 0.0085$) but was not related to either the volume or percentage of available milk expressed.
- Pattern 2 (the Symphony pattern) removed as much milk in a 5 min expression period as what the baby removed during a breastfeeding.
 - This suggests that, when used appropriately, the Symphony will be able to maintain lactation, just as the demand breastfeeding infant does. This is of most importance to mothers of preterm babies who may be required to express milk for their baby for up to 3 months.
- An efficient means of removing milk from the breast may be achieved by using a combination of expression patterns.
- The analysis of the temperature of the nipple and breast shows a similar response of the breast to both expressing and breastfeeding.
 - This highlights that applying suction with a breast pump does not cause constriction in the nipple.