

## The Neuroprotection of Oral Enjoyment by Giving Milk Drops

Dr. Brown Webinar  
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### Learner Objectives:

1. Name two examples of normal NICU care that may have a negative impact on oral feeding.
2. List one major developmental reason why premature infants are at increased risk when they receive negative oral experiences.
3. Describe one reason why oral immune therapy may not be enjoyable to premature infants.

### Disclosure

I have no actual or potential conflict of interest  
in relation to this program/presentation.

### What happened?



### Background / purpose

- Concern for ELBW / LBW infants
  - Increase oral aversion
  - Inability to take full oral feedings at 40-44 weeks CGA
- Literature search:
  - Evidence: Breast milk drops: safe / immunity
  - No research: Oral enjoyment
- IRB approved project
- Medical Team: - 7 Neonatologists 12 NNP
  - 44 bed Level 3 NICU with private rooms
  - Focus: 23-33+6 week infants
  - Milk Drop Protocol: standard of care

### Method and Hypothesis:

- Method:
  - Quasi-experimental design was developed
  - Controls: discharged prior to intervention being started
  - Convenience subjects: born after intervention was initiated
  - Controls / subjects randomly matched / GA and gender
  - No exclusions per medical team request

#### Hypothesis:

The infants who received milk drops with cares & gavage feedings would have a shorter length of stay than infants who had not received milk drops.

## Expenses and Education

- Expense:
  - Milk provided by mother/ donor...
  - Meetings / Printing:
  - Data Collectors: staff nurses
  - Champions: team leaders
- Education:
  - Nurses: Mandatory net learning Meetings / Emails
  - Parents: Brochure  
Two scent hearts to bring back



## Intervention & data collection:

- Intervention:
  - Start on 3<sup>rd</sup> day of life until discharge
  - Milk drops **OFFERED**  
Every set of cares or gavage feeding
  - Volume limited by CGA and status
  - Volume not considered intake
  - If NPO...doctor determines / orders
- Data collection – every intervention
  - Physiological data-before, during, and after the intervention
  - Response to milk drops

Volume of Milk Drops based on: Corrected Gestational Age or Status		
CGA/status	Milk Drops w/ cares or gavage feedings	Document as intake
NPO	See orders	No
24-26 wks	≤ 4 drops	No
27-28 wks	≤ 0.1ml drops	No
29-30 wks	≤ 0.3ml drops	No
31-33 wks	≤ 0.5ml drops	No
34-36wks	≤ 1.0 ml drops	No
≥ 37 wks	≤ 2.0ml drops	No

## Rationale Research & Safety Results... Videos Q&A

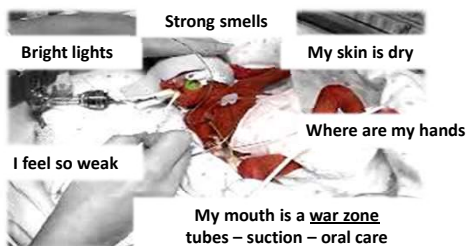


## Rationale...Before I was born



I used all of my senses  
 I would taste & swallow the amniotic fluid  
 This fluid has the scent of my mother  
 I would touch my face & my mother holds me  
 I could see light and I usually fall asleep  
 as I listen to my mother's heartbeat.  
*I love her*

## Everything changed



## I miss my mother



## Very Low Birthweight Infant

(VLBW  $\leq$  1500 gm)



- 85% survival rate
- 50-70%: later dysfunction
  - cognitive
  - behavioral
  - social delays
- 80% of premature infants
  - difficulties with feeding
  - leading developmental issue

## Suck Swallow Breathe (SSB)



Sucking develops at 15-16 wks

Swallowing develops at 14-17 wks

complicated process

26 muscles / 6 major nerves



Coordination of suck-swallow-breathe

evolves around 31-33 wks



matures around 37-38 wks



## However...

- necessity of normal NICU care
- negative experiences
  - suctioning
  - tube insertion
  - taping
  - oral care
- may affect ability and desire to eat

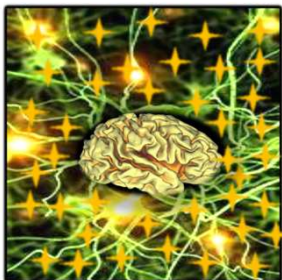


## A major reason for increased risk is...



- Structural differentiation
- Occurring rapidly
- 23 to 32 weeks gestation
- Over 100 billion neurons

## Development of neural networks



Dependent on:

- molecular cues and activity
- more frequently stimulated
- more likely permanent

## However....



Neural activations

- not reinforced / experience
- may become lost

## Neuroprotective Interventions...



- Support the developing brain
- Promote normal development
- Prevent disabilities

## Nutrition is important



- Neuronal and glial cell growth
- Developmental outcome
  - as rate of weight increases
  - risk of poor outcome decreases
- Breast milk
  - optimal nutrient composition
  - greater white matter and brain volume
  - fewer neurodevelopmental disabilities

## Control the environment



- turn down lights
- decrease the activity
- decrease the noise

## Developmentally



- Boundaries
- Swaddle
- Isolettes
- Pacifiers
- Socially

## Kangaroo care



- Skin to skin
  - mother's heart beat
  - comforting touch
  - familiar scent
- Benefits
  - stabilize heart rates & improve oxygenation
  - decrease crying & increase sleep time
  - improve bonding
  - increased success w/ breastfeeding
  - often earlier discharge home

## What has this to do with oral enjoyment and feeding?



## National Association of Neonatal Nurses

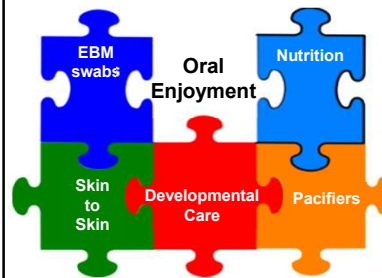


"Oral feeding preparation begins at birth.

Our job is to ensure that every feeding experience is a positive, pleasant, and nurturing time, regardless of size or age, or route or volume of the feeding."

NANN Developmental Care

## However...



- Feeding preparation begins at birth
- Oral attempts begin at 32-34 weeks
- Missing piece?

## For the infant born at 23 weeks...



- 9 to 11 weeks
  - suctioning
  - tubes
  - oral care
  - pacifiers
- most critical time of structural differentiation of the brain

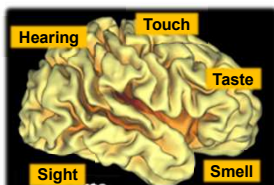
## If this little one ...



Still in his mother's womb

- licking
- tasting
- sucking
- swallowing

## What we do know....



### Neuroplasticity...

- ability to change
- result of experiences
- filtered through senses

How to harness this knowledge?

## Doing what we already do...



- adding enjoyable oral component
- deliberately and consistently
- around the clock
- cares / gavage feedings
- multisensory oral experience



## Setting the stage...



- Cares completed
- On your side
- Boundaries
- Scent heart
- Hands to face
- Only thing left to do is enjoy

## Only thing left to do is enjoy...



- Place a drop or two of milk on your lips
- As you lick - we **offer** a swab or pacifier  
**You become a participant**
- If you open your mouth, **accept**, and suck
  - give more milk - a drop at a time
- If you lick but **refuse** the pacifier
  - just let you lick milk – a drop at a time
- However, if you **don't respond**
  - we will let you rest
  - had a positive oral experience
  - another opportunity at next feeding

## Offer...accept



Place a drop or two of milk on their lips



As the infant licks  
**offer** a swab or pacifier



If infant opens their mouth to  
- **ACCEPT** pacifier/swab & sucks  
- more milk – slowly a drop at a time

## Offer...refuse the pacifier



Place a drop or two of milk on their lips



As the infants licks  
**offer** a swab or pacifier



If infant **REFUSES** or thrust their tongue  
- remove the pacifier  
- **LICK** milk slowly a drop at a time

## Offer...no response



Appears asleep

- place a drop or two of milk on their lips
- offer swab/pacifier
- **many will respond** - let the infant guide

However if there is **no response**

- allow them to rest
- a positive oral experience
- opportunity at next feeding

## As you mature...



- Associate hunger with eating
  - wake up before feedings
  - active, alert, and waiting

## Now when you...

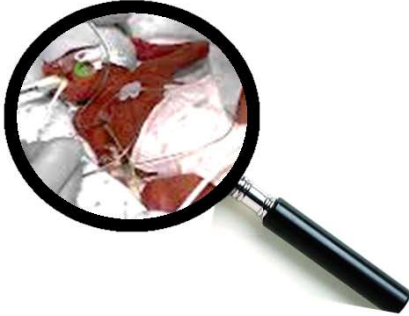


- Taste the milk
- Offer the nipple
- Start to root
  - rooting sets the stage for correct tongue position
  - getting ready to nurse / bottle
- practicing and enjoying

## You know exactly what you are doing!



## Research & Safety of Giving Milk Drops



## Research and Safety



### Rodriguez et al

- Pilot study: Safety / Immunoglobulins
- Subjects: ELBW: m weight 657g / m GA 25.5 wks
- Method: 48 hrs of life - 0.2 ml every 2hr x 48hr
- Results: All infant completed protocol  
Immunoglobulins - wide variation  
O2 saturations stable or increased  
No adverse effects  
Infants sucked on ETT

### Montgomery et al

- Quantified feasibility / safety of Rodriguez' study

## Based on this research



### Breast milk swabs

- oral immune therapy
- prevent Ventilator Associated Pnuemonia (VAP)

## But are breast milk swabs for oral care enjoyable?



- Mouth
  - infant's most sensitive organ
  - infant has most control
- Insert a swab or pacifier
  - form of invasion
- Infant must be given control
  - to trust us

## Milk drops and control



- Offer a swab or pacifier
  - asking permission
- Root or open their mouth
  - accepting
  - participating
  - choice
  - in control

## Natural progression....cue based feedings



Nurses teach the parents...

- to let the infant guide them
- to observe their infant's cues
- allow time to start / stop / restart

When oral feedings are started parents...

- are calmer and more relaxed
- infant is in charge
- enjoyment is most important



- Simple – no expense intervention
- Documented in electronic medical record
- Medical staff and therapists
  - include response to milk drops
  - assessing for oral feeding readiness



- ELBW /VLBW home 36-37 weeks
- Some exclusively breastfeeding

## Results of The Milk Drop Study



## Major Findings: Length of Stay

Gestational Age	Number of Subjects	Mean LOS Subjects	Number of controls	Mean LOS controls
24	2	90	2	135
25	3	86	3	127.7
26	6	88.8	6	90.8
27	5	83.4	5	98.2
28	5	53	5	64.8
29	6	56.8	6	65.8
30	9	47.2	9	55.4
31	20	41.5	20	38.5
32	16	30.1	16	34.6
33	27	23.6	27	24.1
	AVG LOS	44.11	AVG LOS	49.30

## Incidental Findings: Cost / Savings

	Subjects	Controls
Costs	\$73,899.00	\$79,170.00
Adjusted costs	\$73,955.00	\$82,916.00

Estimated savings on these 99 infants: > \$663,000.00



## Comments from parents and nurses



## Parent's comments



- Dad of 24 weeker - now 35 weeks: I love to watch him take his drops of milk. His oxygen levels are at their best when he is getting those drops of milk.
- Mother of 32 weeker: When my baby was first born, she sucked on her pacifier but started refusing it. Since she is getting milk drops she loves to suck again.
- Mother of 31 weeker: I like that my baby is enjoying something orally every time she is being gavaged. She wakes up early and calms right down as she receives her milk drops.
- Mother of 25 weeker - now 32 weeks: When my baby kangaroos she is not happy until she is cradled at my breast. I know the milk drops are a big part of this.
- Mother of 27 week twins - home at 37 weeks: My babies are coming home exclusively breastfeeding - just what I hoped for.

## Standard of Care: Nurses' comments



Rowdy infants become calm



Immune therapy and oral enjoyment



Isolettes less of a barrier  
... milk drops a way to bond



Even one drop of milk...  
associate ... mother

## Standard of Care: Nurses' comments



- Milk drops aren't just for premies
- Full term infant:
- Vented, on high settings / 60% O2.
- Dopamine and Fentanyl drips
- Receiving sedation every 2 hours for agitation above his Fentanyl drip.
- After milk drops were started
- Infant slept 3-4 hours at a time
- No additional sedation
- Able to wean ventilator and pressors.
- The mother said...
- I feel involved...that I \_doing something to help my baby.



## Sweet Videos of our babies





### What can and did happen



23+ wks - born  
3rd DOL milk drops start  
28 wks PDA ligated  
35 wks trsf Level 4 NICU  
severe chronic lung  
Mom requests  
milk drops continue  
52 wks 1st bottle-CPAP+6  
54 wks Demand fdgs



56 wks Home NC  
58 wks Speech signs off



~ 76 wks  
Viral pneumonia  
PICU > ECMO



~ 80 wks home bottling  
Holding her bottle **WITH HER FEET** 😊

### Frequently asked questions

1. Is oral immune therapy the same thing as milk drops?
2. Do you only give plain breast milk for milk drops?
3. Would you give formula for milk drops?
4. What if an infant in NPO?
5. Do you give milk drops when the infant nurses or bottles?
6. Do you start the gavage feeding before giving milk drops?
7. How long does this intervention take?

### Implications for research

- 1. Replicate study with larger group of infants
- 2. Other possible studies
  - Milk drops and reflux
  - Cognitive, behavioral, social responses

### Where do we go from here?

How do we start giving milk drops in our unit.

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Standard of Care

Routine order set for NICU

Electronic medical record

More information: [borourke53@gmail.com](mailto:borourke53@gmail.com)

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**Q/A responses**

**Does this take the place of your oral care practices?**

No, oral care is still important to cleanse the mouth of any thick oral secretions that may have accumulated... but oral cares are probably not enjoyable. For milk drops, after all cares are completed (including oral care) and the infant is nested on their side with their hands tucked, I start my gavage feeding. As the feeding is going in, I give all my attention to the infant...slowly giving milk drops...touching...talking etc. It is a wonderful experience.

**Why do you use a cotton swab?**

Actually, those videos were from 2015. Back then, cotton swabs were still being used in our unit for oral care. That is a little confusing-sorry about that. Now we only use the soft foam swabs. The micro-preemies usually are on vents so the swabs are soft and small enough for these tiny infants to accept and suck on.

**I am an outpatient OT who works with feeding kids. What is the advantage of using a swab rather than a pacifier with milk drops?**

The swabs are used for micro-preemies. The swabs are easier for these infants to suck on - especially when vented as their mouths are so small. However, they eventually do accept the preemie pacifiers. We still give them a drop or two of milk first...to allow them to taste...then offer the pacifier. As they open their mouth and accept, we slowly give milk, a drop at a time while they suck on the pacifier.

**Are you using milk drops with infants on bubble cpap?**

We do not use bubble CPAP - but we do use RAM CPAP. Milk drops are given with all respiratory support. The milk drops are given slowly a drop at a time - not as a bolus. It is important to acknowledge that infants swallow their own saliva - even the micro-preemies. In utero, the fetus sucks and swallows approximately ~200-250 ml/kg fetal / wgt / day of amniotic fluid. When you give the milk drops slowly, the infant can enjoy, and respiratory-wise often saturates better as they receive the milk, slowly a drop at a time.

**What were you doing for oral cares prior to using the milk drops?**

Our standard of care was EBM (Expressed breast milk) swabs for oral care. We still do oral care with breast milk swabs but now after all cares are done, instead of covering the isolette and leaving the infant alone, we take time to give them a drop or two of milk and offer them an opportunity to enjoy the breast milk, slowly a drop at a time.

**What type of syringe do you use?**

We use oral syringes. We are just very diligent about giving the milk slowly a drop at a time

**Do you undertake any other airway precautions for infants receiving milk drops who may not be able to go on their side?**

You may only be able to only give a drop or two of milk to let them taste the milk. Even tastes let them have an enjoyable oral experience - eventually they will be able to be repositioned and they will be ready for more. Another option may be to position the infant on their side for milk drops and reposition the infant after. You are right - we cannot keep these infants on their sides all the time. Repositioning is important.

**What is the name and brand of the swab being used for milk drops?**

There are multiple companies who make these foam swabs but the name of the company on our swabs is "Plak-vac" and then also Trademark Medical in St. Louis, 800-325-9044. They come in various sizes which is nice for the micropreemies.

**I am a huge believer in oral cares for our NPO patients. What ways would be best to do to keep their mouth clean, but not create an aversion with oral swabs?**

I also feel oral care is important. Saliva and mucous accumulate as the infant sleeps - great media for bacteria. I do oral care and our standard of care is EBM swabs when possible for oral care. These cares are medically necessary. The status of NPO is temporary and depending on the situation, the doctor may decide to allow milk drops to be given. However, if the infant is ordered to be strictly NPO, the important part will be to restart the milk drops consistently when the infant eventually restarts feeds again. Infants who were NPO resume their love of milk drops when they restart - and do well.

**Are you concerned with higher levels of CPAP and aspiration risk?**

We were concerned and discussed this with our medical team. They explained that infants have saliva, and most are swallowing it. A long as the milk drops are given slowly, a drop at a time, and stopped when the infant stops responding, the risk of aspiration is not any worse than the aspiration of their own saliva. Also, the immunological pluses of breast milk make it another reason to give milk drops.

**The moistened swabs offered after a milk drop... are they just cotton tip swabs moistened with milk? Water? What are you using on those?**

We moisten the swab with milk. Some of my videos were taken when we were still using cotton swabs. We now use foam applicators. They come in various sizes which is nice for the micro-preemies.

**I absolutely love this! I love how you've made this the baby's choice. And while I also appreciate associating of milk drops with feeds, I have been thinking about the stress of cares. I have been wondering about giving milk drops at the beginning of cares to decrease the stress babies experience during cares. What are your thoughts on doing milk drops at the beginning of cares as well as at the end?**

I understand what you are saying, but if you give the milk drops first, will the infant associate milk drops with the stress of cares? You will find that after cares, after the infant is tucked and settled, they may appear asleep. I still give them a drop or two. They may not taste the first drop, so a minimum of 2 drops are kind of a normal for me. Then if they respond and open their mouth, they are not too stressed - they relax and calm - suck so sweetly. I am still always amazed. I make sure I am holding their head as I give the drops, so they understand touch is awesome too. I talk to them...it is a comforting, nurturing...almost a social event. They are not stressed -they like it. I hope this is the last thing they "remember."

However, if they are truly asleep, they will not respond and that is OK. As I said, even giving them a drop of milk has given them the taste of the milk - still an enjoyable oral experience.