Neurologically Supportive Labour Ward and NICU Environments

Dr Nils Bergman
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www.kangaroomothercare.com

Really ??
Early Infant Care

Hominines were prey at Sterkfontein, “Cradle of Mankind”

Nothing an infant can or cannot do makes sense, except in light of mother’s body

“Scientific foundation” ... a synthesis
“Scientific foundation” ... a synthesis

EVOLUTIONARY BIOLOGY
Everything else
The Brain
The DNA

The Place ENVIRONMENT
FITNESS EXPERIENCE ADAPTATION

“except in the light of mother’s body.”

“needed neural processes”

“buffering protection of adult support”

ZERO SEPARATION

Neurologically Supportive Labour Ward and NICU Environments.

“except in the light of mother’s body.”
"Scientific foundation" ... a synthesis

**EVOLUTIONARY BIOLOGY**

Everything else  The Brain  The DNA

**The Place**  **ENVIRONMENT**  **FITNESS**  **EXPERIENCE**  **ADAPTATION**

SPECTRUM of expression in POPULATION

Platform for better understanding of PUBLIC HEALTH ...

... policy and practice that impacts the care of mothers and babies.

**MOTHER** is the key to neurodevelopment ...

**... because she is the RIGHT PLACE!!**

**The Neuroscience of Birth & Breastfeeding**

**IT MATTERS**

HOW WE ARE BORN
In the early stages of NICU design as life-and-death treatments were being refined, the impact of light, noise, movement and other sensory stimuli was considered of minor importance.

As long-term developmental status has replaced the survival rate as the focal point for evaluation of the quality of neonatal care, interest in the impact of the physical environment on the developing premature brain has accelerated.

“Future NICU design should recognize that the baby must spend most of its time in its mothers arms…”

“Mothers’ arms – the past and future locus of neonatal care?”

“... the baby must spend most of its time in its mothers arms to get the full benefit of her sensory environment as experienced throughout our evolution”
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The baby is born, and a young lady becomes a mother, the couple become a family - a wonderful bonding experience - not to be disturbed.

Table 1: Definition of phases/behaviours identified

<table>
<thead>
<tr>
<th>Phases</th>
<th>Behaviours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Birth cry</td>
<td>Intense crying just after birth</td>
</tr>
<tr>
<td>2 Relaxation phase</td>
<td>Infants resting/recovering. No activity of mouth, head, arms, legs or body</td>
</tr>
<tr>
<td>3 Awakening phase</td>
<td>Infant begins to show signs of activity. Small thrusts of head: up, down, from side-to-side. Small movements of limbs and shoulders</td>
</tr>
<tr>
<td>4 Active phase</td>
<td>Infant moves limbs and head, is more determined in movements. Rooting activity, 'pushing' with limbs without shifting body</td>
</tr>
<tr>
<td>5 Crawling phase</td>
<td>'Pushing' which results in shifting body</td>
</tr>
<tr>
<td>6 Resting phase</td>
<td>Infant rests, with some activity, such as mouth activity, sucks on hand</td>
</tr>
<tr>
<td>7 Familiarization</td>
<td>Infant has reached areola/ nipple with mouth positioned to brush and lick areola/ nipple</td>
</tr>
<tr>
<td>8 Suckling phase</td>
<td>Infant has taken nipple in mouth and commences suckling</td>
</tr>
<tr>
<td>9 Sleeping phase</td>
<td>The baby has closed its eyes</td>
</tr>
</tbody>
</table>

Best → midwife + doula + father ↓ cortisol ↑ oxytocin ↑ dopamine

PROTECTOR

START @ BIRTH

FATHER AT BIRTH

BIRTH COMPANION

ZERO SEPARATION

Best → midwife + doula + father cortisol oxytocin dopamine
There are "needed neural processes"!

On abdomen … wipe … quiet & slow

... wait for cord to stop pulsating …

Anderson 2011

Conclusions: Blood flow in the SVC was higher in infants where delayed cord clamping was performed. All three infants with intraventricular haemorrhage (IVH) (of any grade) had low flow.

DIM the lights!

...move to chest … cover … LEAVE!!

Conclusions: Delayed cord clamping, compared with early clamping, resulted in improved iron status and reduced prevalence of iron deficiency at 4 months of age, and reduced prevalence of neonatal anaemia, without demonstrable adverse effects. As iron deficiency in infants even without anaemia has been associated with impaired development, delayed cord clamping seems to benefit full term infants even in regions with a relatively low prevalence of iron deficiency anaemia.
EYE CONTACT

LEAVE! … but watch and observe …

QUIET ALERT

… watch APGAR, condition & behavior

Continue maternal care …

… third stage
… perineum
…… etc.

… in a calm and relaxed environment!

Mercer 2007

Many of the care practices used to
assess and manage a newborn immediately
after birth have not proven efficacious.
Prof John Lind:

“The family is born in the labour ward.”

DIM the lights!

WHY DO BABIES CRY AT BIRTH??

ZERO SEPARATION

SUPPORT AND FOCUS ON DYAD

Prof John Lind:

“The family is born in the labour ward.”

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DIM the lights!

WHY DO BABIES CRY AT BIRTH??

ZERO SEPARATION
Early skin-to-skin - Caesarean

Photos from Karolinska Institute … thanks to Bjorn Westrup.

The natural caesarean: a woman-centred technique

J Smith, T Plunt, N Milford

*Division of Maternity, Women’s and Children’s Services and *Department of Anaesthesia, Queen Charlotte’s and Chelsea Hospital, London, UK, and †Centre for Reproductive Health and Gynaecology, Institute of Reproductive and Development Biology, Imperial College, London, Department of Gynaecology, London, UK

Correspondence: Prof JS Milford, Division of Maternity, Women’s and Children’s Services, Queen Charlotte’s & Chelsea Hospital, London, UK

Although such efforts have gone into promoting early birth and skin-to-skin contact, this intervention may have contributed to increased rates of surgical correction and subsequent postnatal blood donation. We describe a novel approach that reduces the incidence of surgical birth by allowing (1) the patient to select the birth of their child as a pre-partum decision, (2) the delivery team to carry out a physiological examination and (3) the child to be born relatively quickly, which enables a better intrauterine environment for newborns. This approach involves minimizing exposure to newborns, reducing common problems, and improving overall outcomes.

Effect of delayed versus early umbilical cord clamping on neonatal outcomes and iron status at 4 months: a randomised controlled trial

Conclusions Delayed cord clamping, compared with early clamping, resulted in improved iron status and reduced prevalence of iron deficiency at 4 months of age, and reduced prevalence of neonatal anaemia, without demonstrable adverse effects. As iron deficiency in infants even without anaemia has been associated with impaired development, delayed cord clamping seems to benefit full-term infants even in regions with a relatively low prevalence of iron deficiency anaemia.

ZERO SEPARATION

Stavanger, Norway

GA 29+3
Weight 1190g
The place is different, not the care

**ZERO SEPARATION**

Good vital signs
Delayed cord clamping 30-60sec
Nasal CPAP on at 1 min

90 sec old

A small and fragile baby is expected. Preparations for stabilization according to "ABC"

Bjorn WESTRUP (Karolinska)

Large family room where we also care for mothers who are in need of medical care, except intensive care

Continue skin-to-skin in the NICU …
Neurologically SupportiveLabour ward and NICU Environments.

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Discontinue:
Giving water
Glucose water
Infant formula
Separation
Pacifier (dummy)

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American Academy of Pediatrics
POLICY STATEMENT
Breastfeeding and the Use of Human Milk

abstract
Breastfeeding and human milk are the normative standards for infant feeding and nutrition. Given the documented short- and long-term medical and neurodevelopmental advantages of breastfeeding, infant nutrition should be considered a public health issue and not only a lifestyle choice. The American Academy of Pediatrics reaffirms its recommendation of exclusive breastfeeding for about 6 months, followed by continued breastfeeding as complementary foods are introduced, with continuation of breastfeeding for 1 year or longer as mutually desired by mother and infant. Medical contraindications to...
Breastfeeding and the Use of Human Milk

**Conceptual change**

**Dyad care**

**Breast first hour even Caesarean**

**Continuous SSC**

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**Suckling and expression should start very early!**

**Skin-to-skin “causes” breastfeeding**

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From Kim Luong Chi, Vietnam:

- 29 week GA – zero separation & skin-to-skin contact → suckling at 60 minutes.

- 26 week GA – zero separation → suckling at 6 days.

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**Milk Volumes From Day 1 To 6 Weeks**

Parker, J Perinatol, 2012

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Parker LA. J Perinatol. 2012

Parker LA. Breastfeeding Medicine 2015.

- First hour expression (vs. hrs. 2-6) ↓ time to lactogenesis and ↑ production by 130% at 6 weeks (613.0 vs. 267.2).
The ABILITY TO SUCKLE IS WIRED IN EVERY BABY even if premature!!

SUCKLING precedes breastfeeding

DUAL INGESTION SYSTEMS

Alberts: SUCKLING versus FEEDING

Nils’ – human digestion systems

SUCKLING IS COMPETENT
FEEDING IS IMMATURE

MOTHER’S OWN MILK IS SAFE

EVEN HEALTHY NEWBORNS LACK ENZYMES TO DIGEST ANYTHING ELSE
**DUAL INGESTION SYSTEMS**

<table>
<thead>
<tr>
<th>PMA</th>
<th>28</th>
<th>40</th>
<th>64</th>
<th>1y</th>
<th>2y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preterm</td>
<td>Term</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Sucking behavior

Feeding behavior

**SUCKLING**

**PROTECT SUCKLING**

- WHILE ENSURING ADEQUATE NUTRITION -

UNTIL BREASTFEEDING STRONG.

**Shirt becomes “sling”, feed frequently …**

**The Neuroscience of Birth & Breastfeeding**

- The DNA
- The Brain
- Behaviour
- Epigenetics
- Neurodevelopment
- Evolutionary Biology

**ENVIRONMENT**

**ADAPTATION**

**EXPERIENCE**

**REPRODUCTIVE FITNESS**

**BIRTH**

**BONDING**

**BEYOND**

**BREASTFEEDING**

**Feed & Sleep Cycling**

**PREMATURE BREASTFEEDING**

The ABILITY to breastfeed is INNATE.

The physical CAPACITY to breastfeed may however be insufficient in prematures.

Full term babies need no help.

Premature babies will need help.

**BREASTFEEDING THE PREMATURE**
PIBBS
Preterm Infant Breastfeeding Behaviour Scale

rooting 0 - 2
areolar grasp 0 - 3
latch (and fixation) time 0 - 3
sucking 0 - 4
longest sucking burst 1 - 6
swallowing 0 - 2

Nutritive sucking = >5ml swallowed
Full breastfeeding = exclusive Brf

Not so much duration, or density of any sleep stage, or number of sleep stage episodes, but, cycling between quiet sleep and active sleep is what is important

rest-activity cycle is 60-90 minutes long
(Ludington 2006)
This is a healthy sleep pattern
This is a very good cycling pattern
(thanks to Susan Ludington-Hoe)

REM Sleep is supposed to be somewhat active, so HR increases and RR is irregular

**SLEEP CYCLING - Separation vs contact**

In separation:
• Dissociated state
• No cycling, chaotic pattern

48 hour baseline chaotic pattern of activity and quiet HR & RR

**SLEEP CYCLING - Separation vs contact**

In SSC:
• Normal cycling
• Non-chaotic pattern

48 hour baseline chaotic pattern of activity and quiet HR & RR

A skin-to-skin contact session SHOULD NOT be less than one hour or 90 minutes!

Because promotion of sleep organization is so important for normal neurodevelopment, one would expect that the infant’s sleep status could guide clinical care.

Susan Ludington 2006

**PROMOTE SLEEP ORGANIZATION**

**SLEEP STATUS TO GUIDE CARE**

**QUALITY CARE!**

Neurodevelopmental focus:
REQUIRES MOTHER:
SKIN-TO-SKIN CONTACT
**Gut hormones.**
(Uvnas-Moberg 1989)

20 different hormones work in the gut - regulated by the vagal nerve.
Each has a specific function.

**SOMATOSTATIN:**

inhibits the good hormones, contributes to slow weight gain.
At high levels also inhibits release of growth hormone.

**Bad guy** - SOMATOSTATIN:
(produced by fetus, rise 10-fold under stress)

inhibits gastrointestinal secretion, inhibits motility, reduces blood flow to gut and absorption, causes gastric retention, vomiting, constipation.

It takes 30 to 60 minutes to lower somatostatin and other stress hormones.

SLEEP VITAL!!!

**Presentation objectives**

Birth Skin-to-Skin Contact
Ongoing SSC
Breastfeeding behaviour
Breastfeeding wiring
BREASTFEEDING
Sensory stimulation
State organization
Sleep cycling
Feeding frequency
Brain nutrition
BRAIN WIRING

DISSOCIATED INFANT WILL NOT SHOW FEEDING CUES
BREASTFEEDING THE PREMATURE

Premature babies will need help.

BERLITH PERSSON
has provided that help …

PERSSON’S WHEEL!

Step 1  SKIN-TO-SKIN
Continuous skin contact
The newborn must be in the right environment for the behaviours that it is capable of to be expressed. It requires protection from stress and provision of warmth.

KMC provides the “maternal nest”
Ideally this should be done on prematures AT BIRTH. However it can be done later, even with nasogastric tube providing expressed breast milk in the meantime.

Step 2 and 3  Olfactory

- Smell nipple
- Smell milk

The first steps in sequence require smell of the nipple which may take longer in the premature, and then the smelling of milk.

Babies can identify smells and tastes from their time in the uterus in the mother’s milk!

Step 4  Taste

This is re-inforcing the smell. Fullterm seems to skip this!

Step 5  Rooting

These are mouth movements the normal sequence described in the full-terms.

Here the premature requires help, with position and “sipping” = feeling milk in mouth

Step 6  First suckling.

Key step, builds on steps 1 to 5. Must be awake and alert. Alert period is maximal at birth, and lasts 45 - 90 minutes. If missed then, will require feeding, and several hours delay.

Note difference suckling vs sucking! “… myographically distinct”

For late premature lactation, allow suckling to develop in successive alert periods, while feeding by tube.
Step 7  Latching & swallowing

Premature is too physically weak to crawl to nipple, but if held to nipple will at this stage latch on. Once latched, suckling follows. Suckling squirts a controlled dose of milk to the back of throat, which is safely swallowed without any interference of breathing. This is INNATE.

Step 8  First breast milk meal.

Steps 1 to 7 and on take place rapidly in the fullterm. They can occur in the first alert period after birth in a premature if allowed to, but may require a longer period of defined steps in successive alert periods. For late preterm lactation, step 8 is the first time milk is swallowed. Enough to feed the baby.

Step 9  Frequent feeding

In utero, baby is feeding continuously. Demand feeding is NOT SUITABLE for prematures. Feeds should be at most 2 hours apart.

Step 10  Together continuously

**The wheel** is not round. Turns slow at first, but then picks up speed!

Baby Yumna is suckling happily at 30 minutes, gestational age 34 weeks.
Baby Yumna at 3 hours still gets IV line and gavage.

Babies need to have had a good sleep first. They will only have a good sleep if given continuous skin-to-skin contact. Baby should be allowed to get to a state of AWAKE and ALERT by itself. ALLOW TIME → …

Position baby for eye to eye contact, and close the nipple for SMELLING …

“Feeding cues” are any movements that make up the global behaviour of breastfeeding.

In this ultrasound image, the fetus is practising hand to mouth movements: training for breastfeeding behaviour!

This curled tongue is also a feeding cue, prepared for nipple …

This sudden mouth movement took place after 15 minutes Practising LATCH …
When there is evidence of these feeding cues – EXPRESS DROP MILK

Baby Stohm made a lunge for the nipple ...

Note the strong LATCH – the areola is inside Stohm’s mouth.

When feeding – Leave hands free (part of behaviour)

This 34 week conceptional age baby only managed three good suckles before tiring ...
... but she showed mother she was able to breastfeed!
Stohm now needs another sleep cycle, then she needs to do it all over!

In the shirt, Mother CAN NOT breastfeed!!! But can easily loosen and feed frequently …

From 16 or 20 weeks gestation, the fetus is swallowing.
From 26 or 28 weeks gestation the fetus can SUCKLE.
From 36 weeks gestation the fetus is able to SUCK.

SUCKING and SUCKLING sound same, but VERY different.

Breastfeeding & Suckling

Emma's cat: “Zig-Zaq Thomas”

Ziggy … is able to eat and purr (and breathe) at the same time!

Larynx meets uvula, separate airway & foodway.
THE NEWBORN

also has a larynx that meets the uvula, designed to separate the respiratory tract from the gastrointestinal tract, enabling the newborn to feed and breathe simultaneously.

Apes (and all mammals) have a high larynx that separates airway from “foodway.”

Human newborn ALSO!!

Only at 18 months does larynx start migrating, and ability to make more sounds develop → speech.

From “Origins Reconsidered” Richard Leakey.

Breast

SUCKLING and swallowing well coordinated, baby’s OXYGENATION remains good.

Bottle

Sucking and swallowing uncoordinated, baby gets hypoxic, so bad the heart slows.

BOTTLEFEEDING IS STRESSFUL and DANGEROUS

Sucking and swallowing uncoordinated, baby gets hypoxic, so bad the heart slows.
BOTTLEFEEDING IS STRESSFUL and DANGEROUS

(Chen et al 2000)
25 babies in 80 sessions, all <1800g

“There were 2 episodes of apnea and 20 episodes of oxygen desaturation during bottle-feeding and none during breastfeeding. We conclude that breastfeeding is a more physiological feeding method for the preterm infant and bottle-feeding may be more stressful.”

Bottle feeding requires SUCKING, which requires completely different muscles, and does NOT allow co-ordination between swallowing and breathing. Bottle feeding causes STRESS in prematures, and relative post-prandial hypoxaemia.

SUCLING - in and of itself, apart from nutrition intake - has beneficial effects on both mother and baby. SENSORY STIMULATION ....

Suckling induces simultaneous endocrine effects in the gut of both mother and child.

there is a physiological symbiosis between them.

Breast feeding also has psychic effects: CCK is produced, which induces sedation and sleep.

SUCKING uses the largest muscle in the baby’s head, making the smallest movement.

SUCKING requires lots of tiny and weak muscles, making maximum effort;

.... also causes hypoxia, .... and is STRESSFUL!

Neurologically Supportive Labour ward and NICU Environments.

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www.kangaroomothercare.com
Neurologically Supportive Labour ward and NICU Environment

... requires the presence of MOTHER

MOTHER is the key to neurodevelopment ...

... because she is the RIGHT PLACE!!

“Put the patient in the best position for Nature to act upon him.”

Florence Nightingale

SKIN-TO-SKIN CONTACT

... the best position for Nature to act upon him.”

COURSE OBJECTIVES:

At the conclusion of this seminar the participant should be able to:

- Summarize principles from several disciplines that impact breastfeeding.
- Describe the relevance of neuroscience to the early neonatal period.
- Explain why skin-to-skin care is so important to bonding and breastfeeding.
- Apply neurobehavioral techniques to support breastfeeding, in term and preterm infants.
- Link sleeping behavior with feeding behavior.
- Define and apply “Nurturescience” in the NICU.
Nelson Mandela

... in describing the measure of a nation, he has argued that:

“There can be no keener revelation of a society’s soul than the way in which it treats its children.”