

Your Baby's Brain: the latest neuroscience



Nils & Jill Bergman

Cape Town, South Africa

www.kangaroomothercare.com

Your Baby's Brain: the latest neuroscience

1. How your baby's brain WORKS
2. What HARMS your baby's brain
3. What HELPS your baby's brain
4. YOUR parenting brain

www.kangaroomothercare.com

Your Baby's Brain: the latest neuroscience

3. What HELPS your baby's brain

The role of the
sensory environment
Breastfeeding, breast milk
and the IQ debate

It is necessary to work with
Nature, and not against her if we
are to promote health and well-
being in young children, their
mothers and society.

... we can aim to bring
our society,
that we can change,
into better harmony
with our biological "givens"
that we cannot change ...

Infancy cannot be re-run later.

(Peter Cook)

How do we make
parenting choices ??

- For some - this information might be hard !
- Not to look back not to feel guilty !!
- Rather look forward - what to do differently

What does my baby's basic biology need ?

What does my baby's basic biology need ?

MUM!! 😊 and Dad!!

Skin-to-skin contact → SAFE → growth

for brain-wiring

Sleep - completing brain circuits

Breastmilk

Small feeds often (every 60-90 mins)

Bottle gets too much too fast → reflux/colic?

Bonding and attachment

No separation,

no prolonged crying

The baby's growth depends on DO I FEEL SAFE?

On Mum's chest:
- familiar heartbeat
- reassuring voice
- contact & touch

What helps your baby's brain?....

Baby feels **SAFE**

SAFE

BODY calms

Regulates
- heart
- breathing
- etc

Brain & body wire together for health

Health & development

BRAIN calms

Fires "approach" pathways

Baby's brain & mother's brain connect (bond)

Attachment & emotional intelligence

On Mum's chest:
- familiar heartbeat
- reassuring voice
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Regulates
- heart
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- etc

Brain & body wire together for health

Health & development

BRAIN calms

Fires "approach" pathways

Baby's brain & mother's brain connect (bond)

Attachment & emotional intelligence

In incubator:
- strange sounds
- scary smells
- bright lights

Baby feels **UNSAFE**

BODY stresses

Organs prepare for danger, less growth

Body metabolism survival focused not for health

Poor immunity, hypertension diabetes later

BRAIN stress

Fires "avoid" pathways, vigilance

Withdrawal & dissociation

Weaker resilience in later life

pg90

SKIN-TO -SKIN CONTACT

Mothers ANS helps the Baby's ANS to find healthy set points. Baby needs mothers presence and safety to do this!

When these are settled the baby will be able to SELF REGULATE or reach stability on her own. She can cope with change and come back to stability.

Babies need...

Firm touch, Holding and carrying

PRACTICAL

- What can you do if your baby is crying?
- COMFORT HER!
- Meet her needs
 - Contain, still holding
- Her hands near mouth
- Gentle care
- Watch how your own baby copes
- Minimise stress
- NO CONTROLLED CRYING!!

Human touch and hugs
are vital throughout life

"Traditional cultures"
have this carrying right

Infant care patterns
in 186 non-western cultures:

newborn is carried constantly,
always sleeps with mother

immediate feeding if crying
feeding on demand,
every hour or two
breastfeeding for 24 months

(Lozoff and Brittenham, J Pediatrics 1979; 95:478)

How long to do skin-to-skin contact??

All babies at birth, on chest for 1st 6 hours
(Dad should help ☺)

First 2-6 weeks in KangaCarrier
(baby will decide ☺)

Premis continuously while LBW (2-3kgs),
then let baby decide

then as baby gets heavier carry nearer your
spine, in front carrier then back carrier

MOTHER BABY TOGETHERNESS:

MUTUAL EMPOWERMENT

KangaCarrier

Mother is a superior incubator

a kind of invisible hothouse
... through several pathways at
once ...

Technique: AIRWAY PROTECTED!

NOTE SENSORY ASPECTS:

SMELL mother familiar, safe
TASTE hands breast → mouth
CONTACT (firm pressure) ANS
MOVEMENT familiar, reassures
SOUND muffled by chest / shirt
SIGHT darker in shirt (<200lux)
TOUCH (light) only when awake !!

KangaCarrier ensure optimal
SENSORY ENVIRONMENT.

a kind of invisible hothouse

"the wiring of the brain's
pathways is best supported
when it can integrate quality
sensory input through several
pathways at once, particularly
during critical periods of
development." (McCain 1999)

SIGHT

Below 30w GA, fetus
has no pupillary constriction,
adequate only after 34w GA

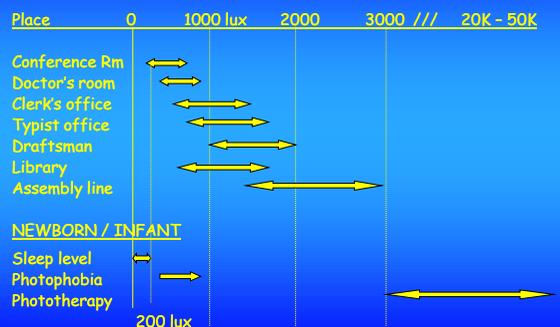
Eyelids below 32 weeks
do not limit light entry.
"In utero, not exposed to light"

Much of this development occurs unrelated to
stimuli or experience, but there are continuous
"spontaneous synchronous retinal waves"

Visual experience is essential
to continued development
of the visual system

... the critical period is
from the latter part of
2nd trimester through the
first 3 years of life.

RECOMMENDED ILLUMINATION



SIGHT:

**AT BIRTH:
DIM THE LIGHTS !!**

Phototherapy... Check eyepads tight fit

Turn baby to face away from window so she sleeps better
Avoid flashes when photographing

SOUND

“Effects of the NICU on auditory attention and distraction”

Ear sends signals to CNS by 23w GA
External sounds all heard – but very dampened

Mothers voice distinguishable salient
tied to circadian rhythms
and vestibular and other sensations.
(Voice discrimination ... early language)

Mother's voice:

“fetal listener making subtle discriminations”
discriminate between actual voice and
tape recording of voice
between familiar and new nursery rhyme
musically aware, “C” vs “D”, by octave

**Auditory development
drives visual and motor
development ...**

**... auditory signal
attracts attention ,
motor system
turns head
and eyes ...**

**Neonates are unable to
focus auditory attention
They listen simultaneously
to everything
... unexpected sounds ...
... brain reveals a limited ability
to maintain stable physiologic,
motor, or behavioural state
and attentional system function ...**

Hearing thresholds (decibel)

| | |
|--|---------|
| threshold of pain | 134 |
| hearing damage - short-term effect | +/- 120 |
| jet engine, 100 m distant | 110-140 |
| jackhammer, 1 m distant / discotheque | +/- 100 |
| hearing damage- long-term exposure | +/- 85 |
| traffic noise major road, 10 m distant | 80-90 |
| moving automobile, 10 m distant | 60-80 |
| TV set - typical home level, 1 m distant | +/- 60 |
| normal talking, 1 m distant | 40-60 |
| very calm room | 20-30 |

Hearing thresholds (decibel)

| | |
|------------------------------------|---------|
| threshold of pain | 134 |
| hearing damage - short-term effect | +/- 120 |
| | 110-140 |
| | +/- 100 |
| hearing damage- long-term exposure | +/- 85 |
| Baby dysregulated | 80-90 |
| Baby aroused, | 60-80 |
| Baby sleeps okay | +/- 60 |
| | 40-60 |
| very calm room | 20-30 |

SOUND: Mothers voice calms

unexpected strange sounds

SMELL

Hearing drives
Eyes and movement
development ...

Newborns prefer amniotic fluid (AF) smell > milk
Breast / bottle fed babies offered choice of
amniotic fluid versus familiar milk ...

| | | | |
|--------|----|---------|-----------|
| BREAST | d2 | 50% AF | 50% milk |
| | d4 | 0% AF | 100% milk |
| BOTTLE | d2 | 100% AF | 0% milk |
| | d4 | 100% AF | 0% milk |

(even though this milk satiates 4 hourly !!)

premies fed through non-oral pathways LACK
sucking-breathing-swallowing coordination
integration of chemosensation-food intake
cephalic phase of digestive processes;
→ therefore display :
"poorer and more unstable sucking
performance than their orally fed peers"

Disgerm and alcohol

Perfumes on breasts
not good !!

| | <u>Harms baby</u> ☹️ | <u>Helps baby</u> 😊 |
|-----------------|---|---|
| SIGHT | Bright lights | Dim lights |
| SOUND | Loud sounds Strange sounds | Mums voice and heart beat, gentle sounds |
| TOUCH | Rough touching or feather touch. Coarse materials | Containment Pressure touch |
| SMELL | Strong smells eg disgerm! | breastmilk |
| TASTE | Medicines! | breastmilk |
| CONTACT | patting | Still, firm holding |
| MOVEMENT | Rough movement, swinging | Gentle walking eg In sling on mum |

Birth is a window of opportunity!
Why?

Hormones of birth:

Progesterone

Lactation starts

In mother prolactin rises → milk
oxytocin rises releases milk

Baby-mother eye-to-eye contact

Baby's mouth on breast

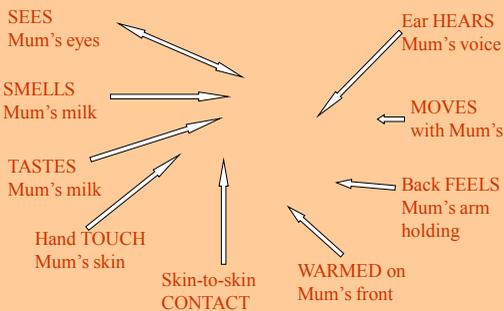


Critical period concept

“Windows of opportunity in early life when a child's brain is exquisitely primed to receive sensory input in order to develop more advanced neural systems.”

R Shore

SENSATIONS THAT WIRE BRAIN



Opening eyes is a sign that baby feeling safe

When eyes connect, circuits in mothers brain and baby's brain synchronise.

This is how bonding begins

- Watch your **own baby** for her individual sensitivities., and her own small signals of distress and peacefulness.
- what works for you together.
- **you are the experts on your own baby!**
- **trust yourselves!!!**

Watch your baby's individual sensitivity to:

light

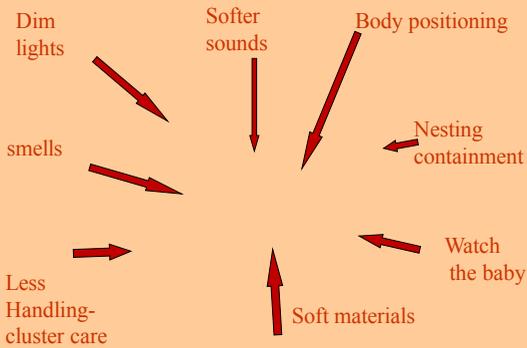
sound

Touch

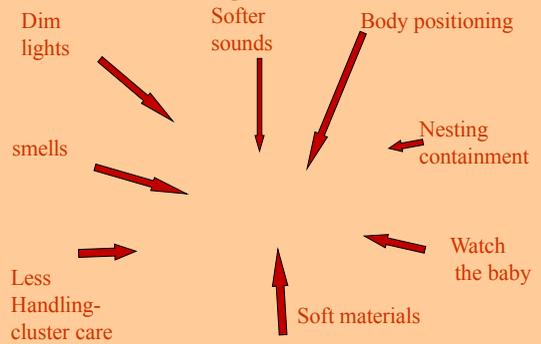
Strong smells...

“Behaviour of the infant is its primary way to communicate” H.ALS

Developmental care in incubator



Developmental care in KangaCarrier!



What does my baby's basic biology need ?

MUM!! 😊 and Dad!!

Skin-to-skin contact → SAFE → growth

for brain-wiring

Sleep - completing brain circuits

Breastmilk

Small feeds often (every 60-90 mins)

Bottle gets too much too fast → reflux/colic?

Bonding and attachment

No separation,
no prolonged crying

Basic Biological Need

SLEEP
For
Mum
and
baby

Cosleeping???



Not like this!! 😊

Cosleeping → safely!!

side cot

-in arms reach



Flat mattress,
no pillows

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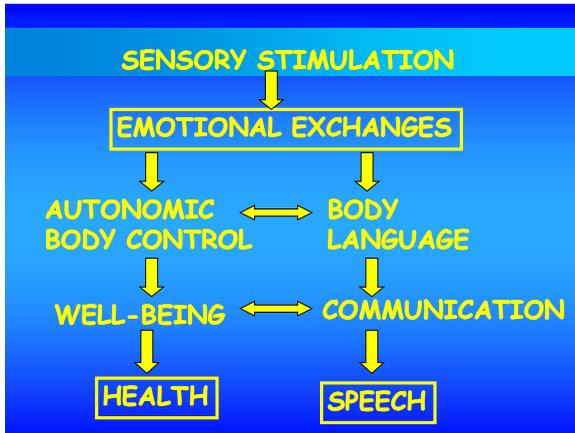
Bonding and attachment

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Your Baby's Brain: the latest neuroscience

3. What HELPS your baby's brain

The role of the
sensory environment
Breastfeeding, breast milk
and the IQ debate



The brain is a

SENSORY ORGAN
BREAST - FEEDING
=
BRAIN - WIRING
SOCIAL ORGAN

a kind of invisible hothouse

BREAST - FEEDING
=
BRAIN-WIRING 90%
NUTRITION 10%

The First Idea

... these
"uniquely human abilities"
are learned;
not passed on genetically or
through natural selection.

Greenspan & Shanker 2006

TRAWL for IQ genes in 7000 children 6 genes → 1% variation

Article Preview

'Intelligence genes' reveal their complexity

29 November 2007 Andy Coghlan Magazine issue 2632

Something as subtle and complex as intelligence was never going to be pinned on just a handful of genes, as a huge trawl across the human genome seems to confirm. Although it did turn up hundreds of genes that make a contribution, their individual effects are so small that for the most part they are barely detectable. This does not mean, however, that intelligence is not inherited.

The research, led by Robert Plomin of the Institute of Psychiatry in London, identified six genes that were strongly associated with high or low intelligence, but even the most powerful of these accounted for just 0.4 per cent of the variation in intelligence between individuals. The six together accounted for about 1 per cent of the variation in intelligence.

Coghlan 2007

TRAWL for IQ genes in 7000 children

Article Preview

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So **Six most powerful genes accounted for 1% of variation in intelligence**

Although it did turn up hundreds of genes that make a contribution, their individual effects are so small that for the most part they are barely detectable. This does not mean, however, that intelligence is not inherited.

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**Alternatively:
there is no gene for intelligence !!!**

Moderation of breastfeeding effects on the IQ by genetic variation in fatty acid metabolism

Archiloshvili Caspi^{1,2}, Benjamin Wilbert¹, Jella Kim-Cohen¹, Ian W. Craig¹, Barry J. Milner¹, Rikie Paulsen¹, Leonard C. Schalkwyk¹, Alan Taylor¹, Helen Watts¹, and Tania E. Moffitt^{1,3}

¹Medical Research Council Social, Genetic, and Developmental Psychiatry Centre, Institute of Psychiatry, King's College London, London SE5 8AF, England; ²Department of Psychology and Neuroscience, and Psychology and Behavioral Science, and Institute for Genome Sciences and Policy, Duke University, Durham, NC 27838-0282, USA; ³Department of Psychology, Yale University, New Haven, CT 06520, USA; and ⁴McGill Graduate School of Medicine, Montreal, QC, H3T 3J4, Canada, New Zealand

Submitted for publication 1 September 2007; accepted for publication 1 October 2007; accepted for review May 18, 2007

Published online on November 5, 2007, 10.1073/pnas.0704292104

PNAS | November 20, 2007 | vol. 104 | no. 47 | 18860-18865

BUT:

there is a gene for breastfeeding to improve intelligence !!!

Caspi 2007

in response to breastfeeding. In Dunedin, breastfed children carrying the C allele showed a 6.4-IQ-point advantage relative to children not fed breast milk ($t = 6.35, P < 0.001$). In contrast, GG homozygotes neither gained an advantage from breastfeeding nor suffered a disadvantage from not being fed breast milk ($t = 0.50, P = 0.62$) (Fig. 1A). Turning to the E-risk cohort, we found that breastfed children carrying the C allele showed a 7.0-IQ-point advantage relative to children not fed breast milk ($t = 7.91, P < 0.001$), whereas GG homozygotes neither gained an advantage from breastfeeding nor suffered a disadvantage from not being fed breast milk ($t = 0.22, P = 0.83$) (Fig. 1B).

**"FADS2" breastfeeders →
New Zealand + 6 IQ
Scotland + 7 IQ**

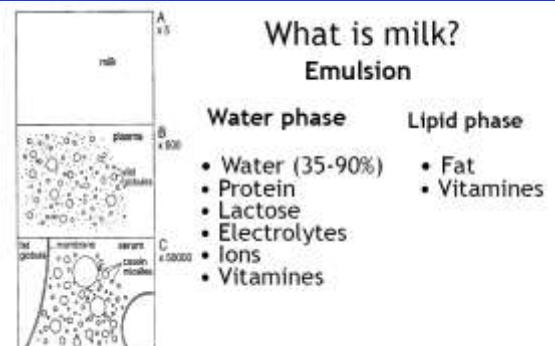
Table 3. Comparison of children in two birth cohorts, grouped according to genotype (rs174573) and breastfeeding, on IQ and covariates

| Sample and measure | rs174573-CC homozygotes | | rs174573-GG homozygotes | | rs174573-Ac homozygotes | |
|----------------------------------|-------------------------|--------------|-------------------------|--------------|-------------------------|--------------|
| | Not breastfed | Breastfed | Not breastfed | Breastfed | Not breastfed | Breastfed |
| New Zealand Dunedin birth cohort | | | | | | |
| Children's IQ | $n = 983$ | $n = 238$ | $n = 653$ | $n = 209$ | $n = 36$ | $n = 48$ |
| IQ (SD) (SE) | 104.0 (10.2) | 102.2 (11.0) | 103.0 (11.4) | 106.0 (12.4) | 100.1 (11.2) | 103.0 (11.0) |
| Nonverbal ability (z score, SE) | 1.0 (0.002) | 0.9 (0.002) | 1.0 (0.002) | 1.1 (0.002) | 0.8 (0.002) | 1.0 (0.002) |
| Verbal ability (z score, SE) | 0.9 (0.002) | 0.8 (0.002) | 0.9 (0.002) | 1.0 (0.002) | 0.7 (0.002) | 0.9 (0.002) |
| Nonverbal ability (z score, SE) | 0.9 (0.002) | 0.8 (0.002) | 0.9 (0.002) | 1.0 (0.002) | 0.7 (0.002) | 0.9 (0.002) |
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CC homozygote for "FADS2", "missing" NOT Brf DID Brf DID Brf

| | | | |
|----|------|-------|-------|
| NZ | 98.4 | 103.2 | 98.9 |
| UK | 97.3 | 104.0 | 100.7 |

Results:
Consistent with previous reports, the difference in IQ scores between breastfed children and those not breastfed was 5.5 and 6.9 IQ points in the Dunedin and E-risk cohorts, respectively.



Fat

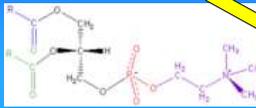
- Energy
- Fat soluble vitamins
- Milk fat consists of ~98 % triglycerides and more than 400 different fatty acids

TRIGLYCERIDE

Left : glycerol, Right: palmitic acid, oleic acid, alpha-linolenic acid → FADS2 →



In phosphoglycerides, glycerol molecule same: two fatty acids esterified



Phospholipids are a major component of all biological membranes,

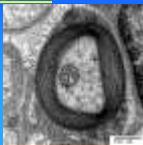
Sphingomyelin particularly concentrated in BRAIN major part of MYELIN.



TRIGLYCERIDE

MYELIN

FATTY ACIDS ARE SPECIES SPECIFIC



Dendritification and myelinisation peaks occur at 2 and 6 months is maximal at one year

At one year: human milk has less protein, but MORE TRIGLYCERIDE !!!

| Fatty Acid | (% wt/wt) | | |
|------------|-----------|-------|------|
| | Cow | Human | Rat |
| 4:0 | 4.0 | | |
| 6:0 | 2.6 | | |
| 8:0 | 1.4 | | 1.1 |
| 10:0 | 3.1 | 1.3 | 7.0 |
| 12:0 | 3.3 | 3.1 | 7.5 |
| 14:0 | 10.6 | 5.1 | 8.2 |
| 15:0 | 0.9 | 0.4 | |
| 16:0 | 27.7 | 20.2 | 22.6 |
| 16:1 | 0.9 | 5.7 | 1.9 |
| 17:0 | 0.5 | | 0.3 |
| 18:0 | 8.2 | 5.9 | 6.5 |
| 18:1 | 15.4 | 36.4 | 26.7 |
| 18:2 | 2.4 | 13.0 | 16.3 |
| CLA | 0.47 | | |
| 18:3 | 0.8 | 1.4 | 0.8 |

FATTY ACIDS ARE SPECIES SPECIFIC

Fat and Energy Contents of Expressed Human Breast Milk in Prolonged Lactation

Deva Maudsl, Wendy Leitch, Susan Dillenburg, Mikko Herra and Emma B. Murnane

Polymers 2005,116:4512-4515

DOI: 10.1155/2005-4515

Up to 6 months, milk is 7.4% fat,

but after 12 months it is 10.7%

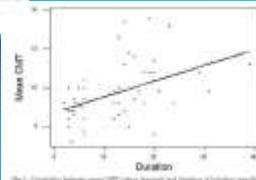


TABLE 4. Subject Characteristics and OMT and Energy Data

| | Short Lactation (3-4 mo) (n = 25) | Long Lactation (1-4 y) (n = 36) | P |
|--------------------------------------|-----------------------------------|---------------------------------|--------|
| Maternal age, y | 30.7 ± 2.9 | 30.8 ± 3.1 | .884 |
| Maternal weight, kg | 66.7 ± 11.8 | 66.8 ± 8.7 | .92 |
| Maternal BMI, kg/m ² | 24.3 ± 3.9 | 22.3 ± 3.8 | .86 |
| Breastfeeding frequency: times per d | 7.1 ± 1.9 | 5.4 ± 2.3 | .003 |
| OMT, % | 7.36 ± 2.03 (2-12) | 10.67 ± 5.07 (2-26) | <.0001 |
| Energy content, kJ/L | 1181.7 ± 863.2 (675-1612) | 1603.2 ± 1012.2 (662-2667) | <.0001 |

Data are expressed as mean ± SD (range). All variables not significant.

Evidence on the long-term effects of breastfeeding

SYSTEMATIC REVIEWS AND META-ANALYSES

Renwick S. Burns, MD, PhD
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Geert G. Veenendaal, PhD, PhD

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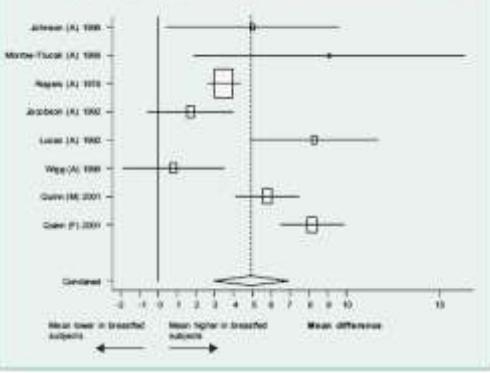


Breastfeeding and Child Cognitive Development

New Evidence From a Large Randomized Trial

Michael S. Kramer, MD; Praveen Abmal, PhD; Elena Blizina, MD; Irina Vanlovsk, MD, MS; Robert R. Platt, PhD; Lidia Matus, MD, MS; Sergio Igweon, MD, PhD; Eric Fombonne, MD; Natalia Bogdanovich, MD, MS; Theresy Chazout, MS; Fran-Paul Colter, MD, PhD; Beverly Chalmers, MS, PhD; Elin Haglund, PhD; Sergei Drozdovsky, MD, MS; Oleg Skogartovsky, MD, PhD; Oleg Trifunovich, BS; Ludmila Kogova, BS; Stanley Shapiro, PhD, for the Promotion of Breastfeeding Intervention Trial (PROBIT) Study Group

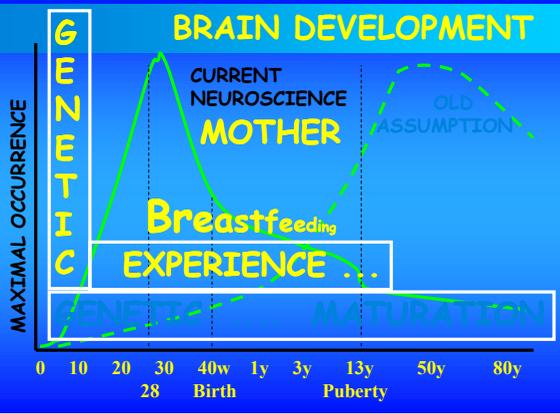
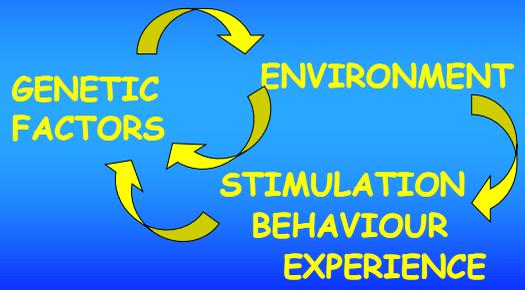
Figure S1. Mean difference in cognitive development scores and its 95% confidence interval between breastfed and non-breastfed subjects in different studies. Whether the estimate was for males (M), females (F) and all (A) is indicated in parentheses.



Results: The experimental intervention led to a large increase in exclusive breastfeeding at age 3 months (43.3% for the experimental group vs 6.4% for the control group; $P < .001$) and a significantly higher prevalence of any breastfeeding at all ages up to and including 12 months. The experimental group had higher means on all of the Wechsler Abbreviated Scales of Intelligence measures, with cluster-adjusted mean differences (95% confidence intervals) of +7.5 (+0.8 to +14.3) for verbal IQ, +2.9 (-3.3 to +9.1) for performance IQ, and +5.9 (-1.0 to +12.8) for full-scale IQ. Teachers' academic ratings were significantly higher in the experimental group for both reading and writing.

Verbal IQ +7.5 Full-scale IQ +5.9

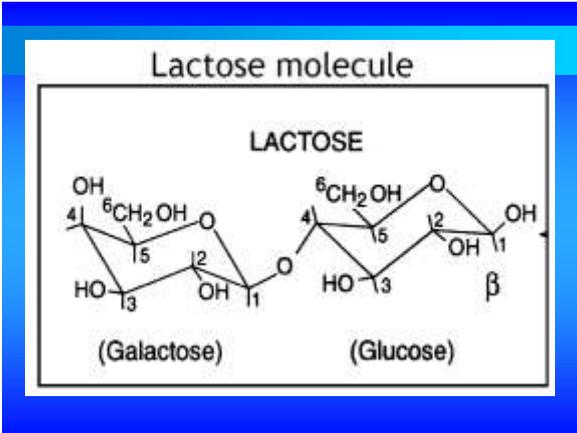
NATURE VS NURTURE



Neuronal Plasticity

"the first three years are decisive"

→ platform for subsequent development of higher cognitive functions.



GIVING GLUCOSE WATER

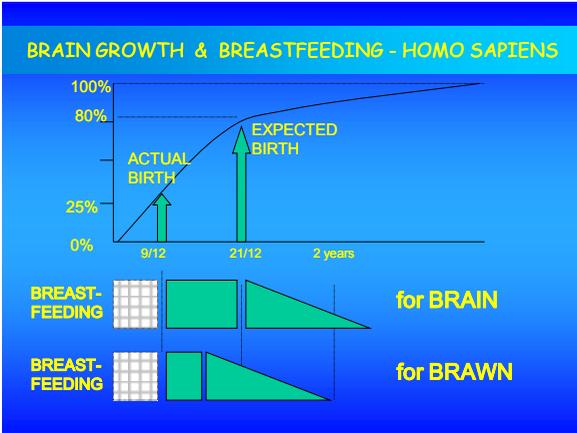
(Martin-Calama et al 1997) 180 infants
 90 exclusive breastfeeding from birth.
 90 extra glucose water AFTER breastfeed, 3 days.

| | |
|--|--|
| Weight loss d1-2 Weight loss d3 Serum glucose d1 Serum glucose d2 | <u>GLUCOSE BREAST ONLY</u> slightly less no difference slightly higher no difference |
|--|--|

| | | |
|---|---|---|
| Exclusive breastfeed 1/12 Breastfeeding 4 months | 50% <i>significantly more</i> | 80% <i>significantly more</i> |
|---|---|---|

BREASTFEEDING AND SMOKING

| | BREAST MILK VOLUME / DAY | 14 DAY WEIGHT GAIN PER BABY |
|----------------|--------------------------|-----------------------------|
| SMOKING MOTHER | 693 ml | 340 g |
| NON – SMOKER | 961 ML | 550 g |
| DIFFERENCE | 30 % LESS | 40 % LESS |



(In the context of divorce ...)

“The mother shall give suck to their offspring, for two complete years”
 - Quran Surah II (Baqarah) verse 233
suckling rights of the infant over ride father’s rights to child.

a kind of invisible hothouse

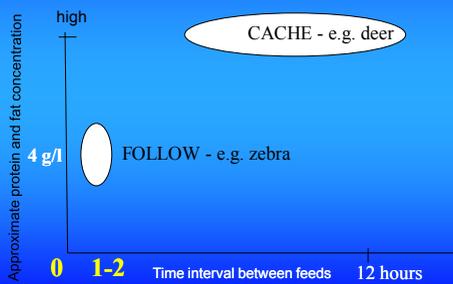
BREAST - FEEDING
 =
 BRAIN - WIRING

DIFFERENT MAMMALIAN CARE PATTERNS EMERGE:

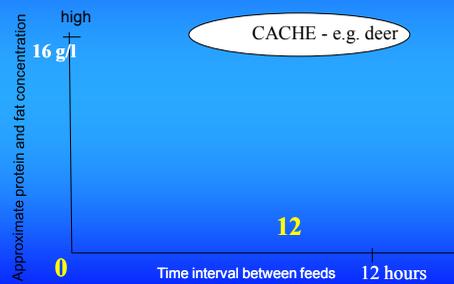
- 1 **CARRY CARE** - relatively immature
immature / altricial, requires heat
- 2 **NESTING** - a little more mature
altricial, needs warmth
- 3 **CACHE CARE** - quite mature
can warm self
- 4 **FOLLOW** - precocial, mature at birth
can fend for self!

| Species | Water (%) | Fat (%) | Casein (%) | Whey (%) | Lactose (%) | Ash (%) | Energy (kcal/100g) |
|----------|-----------|---------|------------|----------|-------------|---------|--------------------|
| Human | 87.1 | 4.5 | 0.4 | 0.6 | 7.1 | 0.2 | 72 |
| Cow | 87.3 | 3.9 | 2.6 | 0.6 | 4.6 | 0.7 | 66 |
| Horse | 88.8 | 1.9 | 1.3 | 1.2 | 6.2 | 0.5 | 52 |
| Dog | 76.4 | 10.7 | 5.1 | 2.3 | 3.3 | 1.2 | 139 |
| Dolphin | 58.3 | 33.3 | 3.9 | 2.9 | 1.1 | 0.7 | 329 |
| Reindeer | 66.7 | 18.0 | 8.6 | 1.5 | 2.8 | 1.5 | 214 |

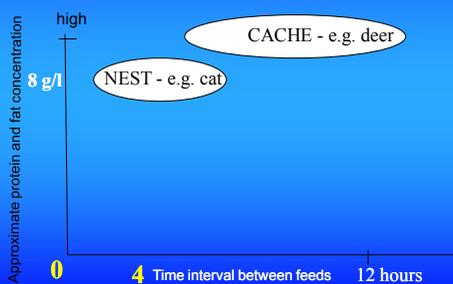
MAMMALIAN FEEDING FREQUENCY AND MILK PROTEIN FAT CONTENT



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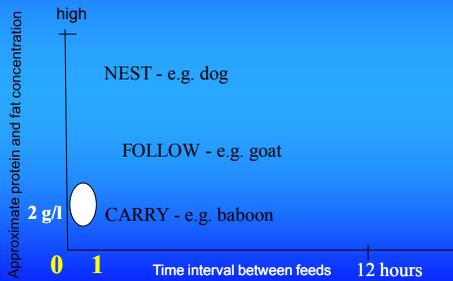


40 million years - PRIMATES

Newborn apes have a powerful grasp reflex, due to quadrupedal gait.

They are "carry feeders" And they feed "continuously"

MAMMALIAN FEEDING FREQUENCY AND MILK PROTEIN FAT CONTENT



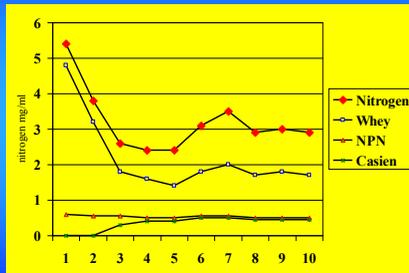
Breastfeeding & Immaturity

Cows milk has another problem - it is a static food

HUMAN MILK - A DYNAMIC FOOD

- The composition of human milk varies immensely:
- 1 during the course of suckling
 - 2 from one suckling to another suckling in a day
 - 3 from one day to another day
 - 4 during the whole course of lactation
 - 5 between one mother-infant dyad to another.

NITROGEN IN MILK IN POSTPARTUM DAYS



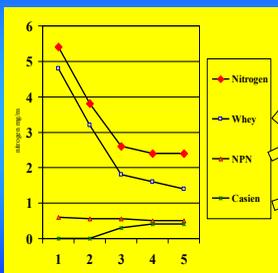
Breastfeeding & Immaturity

COMPOSITION OF HUMAN MILK IN TIME

| Nutrient | Day 2 | Day 6 | Day 10 | Cow |
|------------|-------|-------|--------|------|
| Protein | 2.0 | 1.5 | 1.3 | 3.2 |
| Nitrogen | 0.31 | 0.23 | 0.20 | 0.50 |
| Fat | 2.6 | 3.7 | 4.1 | 3.9 |
| Carbohydr' | 6.6 | 6.9 | 7.2 | 4.8 |
| Energy | 56 | 67 | 69 | 66 |
| Sodium | 47 | 30 | 15 | 55 |
| Calcium | 28 | 25 | 34 | 115 |
| Retinol | 155 | 85 | 58 | 52 |
| Carotene | 135 | 37 | 24 | 21 |
| Vit C | 7 | 6 | 4 | 1 |

Breastfeeding & Immaturity

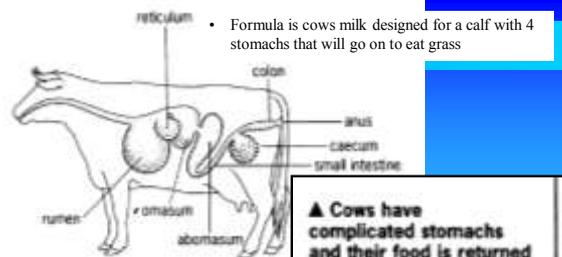
NITROGEN IN MILK IN POSTPARTUM DAYS



Birth: lots of whey extra immune chemicals

NPN is constant, various content

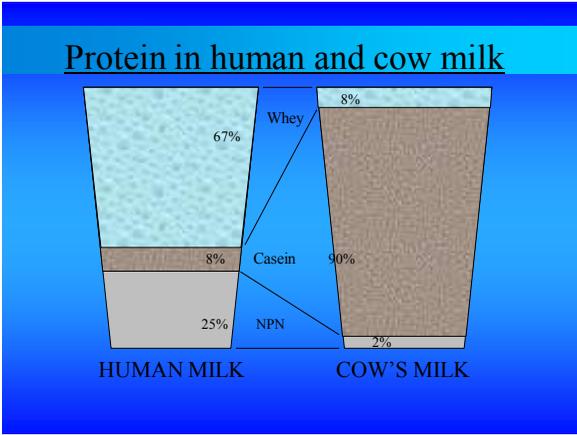
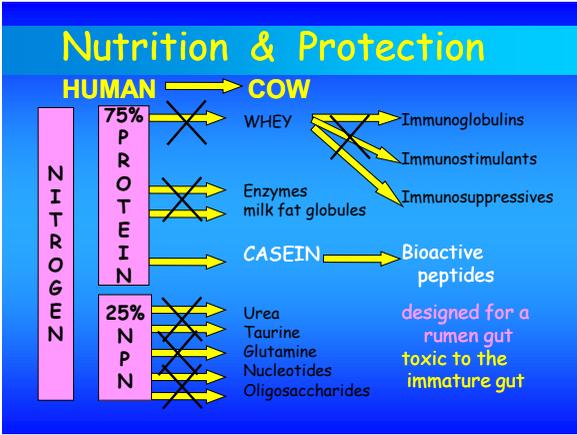
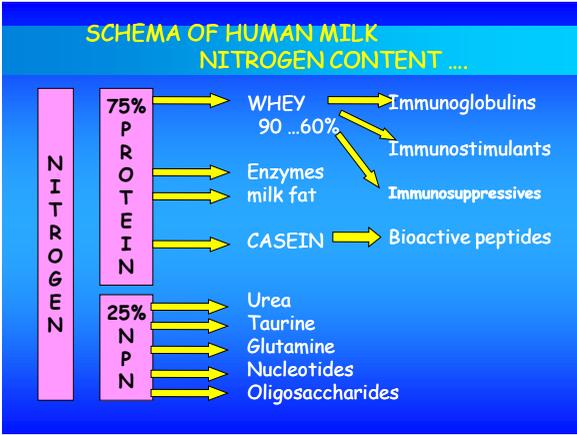
Casien not needed for the immature newborn, has the bioactive peptides needed from mom



▲ Cows have complicated stomachs and their food is returned to the mouth to be chewed again after it has been swallowed.

Caseo-morphines sedate for "cache" care

<http://www.meadowcreekdairy.com>



- ### CASEINS → BIOACTIVE PEPTIDES
- unique and essential effects:
- Phosphopeptides: absorbing calcium and zinc
 - Opioid peptides: regulate gastric and intestinal motility
 - Milk mucins: against all pathogenic bacteria
 - Glycoproteins: against specific bacteria
 - Secretory IgA: against pathogenic bacteria
 - Cell adhesion molecules: prevent necrotising enterocolitis
 - Lactoferrin: growth factor, iron absorption, anti-inflammatory factor, immuno-modulating factor

Nutrition & Protection

25% NPN

2% PROTEIN

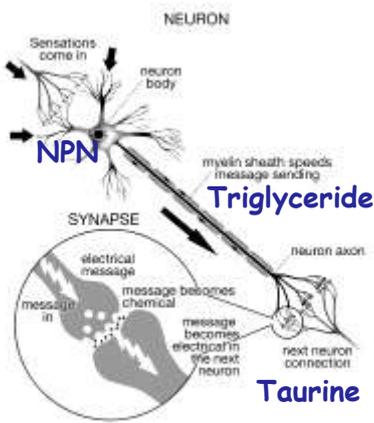
73% NON-PROTEIN NITROGEN

NON - PROTEIN NITROGEN

In cows this is 2 - 4%
In humans 20 - 25%

This is a critical component for the baby !!
Over 200 irreplaceable chemicals ...

- ### NON - PROTEIN NITROGEN
- Urea: conditionally essential nutrient
 - Taurine: aminoacid required neonatal brain, eyes, kidney
 - Glutamine: for stress and sepsis
 - Nucleotides: repair of injury, specially gut, immunological processes, improve cellular immunity
 - Oligosaccharides: bacteria-specific interactions, anti-inflammatory effects



a kind of invisible hothouse

**BREAST - FEEDING
=
BRAIN - WIRING**

a kind of invisible hothouse

**BREAST - FEEDING
=
BRAIN-WIRING 90%
NUTRITION 10%**

a kind of invisible hothouse

**BREAST - MILK
=
PROTECTION**

a kind of invisible hothouse

**BREAST - MILK
=
PROTECTION 90%
NUTRITION 10%**

Be sure the wet nurse has plenty of milk ... because if she lacks it she may give the baby milk of a goat or sheep or some other animal, because the child ... nourished on animal milk does not have perfect wits like one fed on woman's milk and always looks stupid and vacant and not right in the head.

14th century Tuscan text



Human Milk Banking Association of North America
 Meeting the Standards for Human Milk Banking
 Meeting the Milk Banking Needs for North America

**A Safe Alternative to the Absence of Infant's Own Mother's Milk*

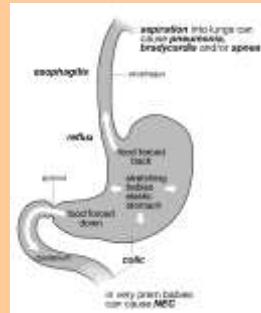
This website is designed to provide information on milk banking and how to contact a milk bank to donate milk or to order donor human milk. This site is also a resource for health care providers and others who are looking for information on HMBANA's resources and services.

<http://www.hmbana.org/>

www.milkmatters.org

Jenny 083 771 6230

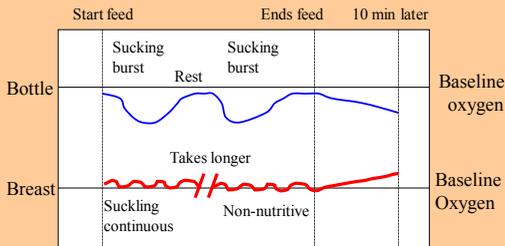
Even a tiny amount of the first milk colostrum is vital for protecting the baby's stomach



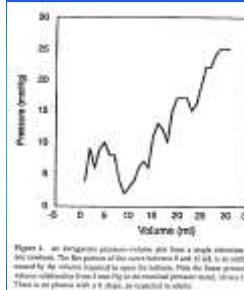
Small feeds often (every 60-90 mins)
 Bottle gets too much too fast
 → reflux/colic?

BOTTLE VS BREASTFEEDING IN PREMATURE

Baby struggles to breathe and suck from bottle at same time



Zangen S et al
 Rapid maturation of gastric relaxation in newborns



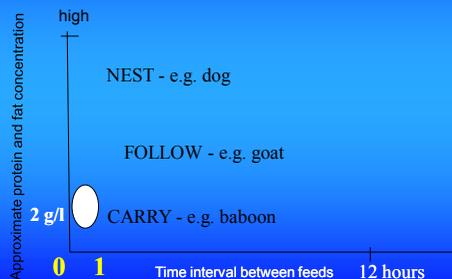
Pressures (mmHg)

Balloon inflates to

- 15 ml no increase
- 20 ml pressure OK**
- 25 ml discomfort
- 30 ml ethical limit

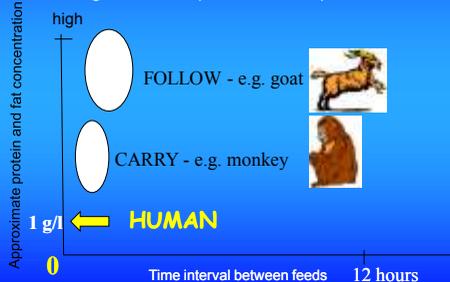
The CAPACITY of a week old baby's stomach is approx 20 ml. (1TBS!)

MAMMALIAN FEEDING FREQUENCY AND MILK PROTEIN FAT CONTENT



CARE PATTERN & MILK PROTEIN

Feeding times compared to milk protein concentration



What does my baby's basic biology need ?

MUM!! 😊 and Dad!!

Skin-to-skin contact → SAFE → growth

for brain-wiring

Sleep - completing brain circuits

Breastmilk

Small feeds often (every 60-90 mins)

Bottle gets too much too fast → reflux/colic?

Bonding and attachment

No separation,

no prolonged crying

Your Baby's Brain: the latest neuroscience

3. What HELPS your baby's brain

The role of the sensory environment
Breastfeeding, breast milk and the IQ debate

QUESTIONS ?? (evaluation !!)