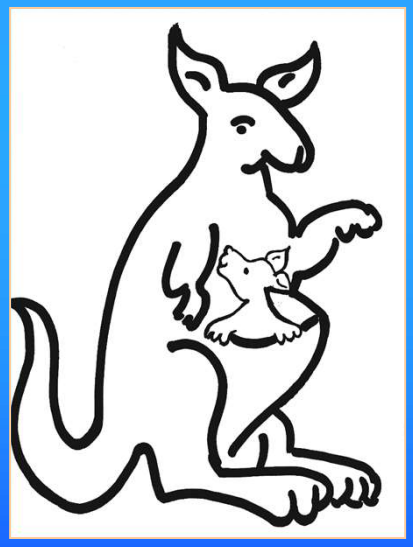
HOW EARLY SHOULD THE KANGAROO POSITION START?



Dr Nils Bergman

MB ChB, DCH, MPH, MD

(USA equiv: MD, MPH ,PhD)

Cape Town, RSA

www.skintoskincontact.com

Evidence gaps: key research priorities

- How can facility based initiation of effective KMC for stable small babies be scaled up?
- Can community-based initiation of KMC reduce neonatal mortality of clinically stable small babies?
- Does initiation of KMC immediately after birth, even for unstable babies, improve survival?

Immediate KMC study

- Individually randomized controlled trial: hospitals in Ghana, India, Malawi, Nigeria and Tanzania. Sample size 4,200
- Newborns <1.8 kg will be allocated to intervention or control group
- Those allocated to intervention will receive skin to skin care starting immediately after birth, and continued thereafter
- Those allocated to control will receive conventional care until considered stable, KMC will be initiated after that
- Primary outcome neonatal mortality

HOW EARLY SHOULD THE KANGAROO POSITION START? SKIN-TO-SKIN CONTACT

Those allocated to intervention will receive skin to skin car
starting immediately after birth, and continued thereafter

THE NEUROSCIENCE BEHIND SKIN-TO-SKIN CONTACT

Those allocated to intervention will receive skin to skin ca
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Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

POLICY STATEMENT

Early Childhood Adversity, Toxic Stress, and the Role of the Pediatrician: Translating Developmental Science Into Lifelong Health

PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Pediatrics 2012;129;e224; originally published online December 26, 2011;
DOI: 10.1542/peds.2011-2662

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Garner 2011

"Early Childhood Adversity"

What about
Early Infant Adversity ?
Early Neonatal Adversity ?

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Early Childhood Adversity, T[illegible] Stress, and the Role of the Pediatrician: Translating Developmental Science Into Lifelong Health

WAIMH Position Paper on the Rights of Infants

Edinburgh, 14-18 June, 2014 (amended March 2016)

WAIMH Position Paper on the Rights of Infants

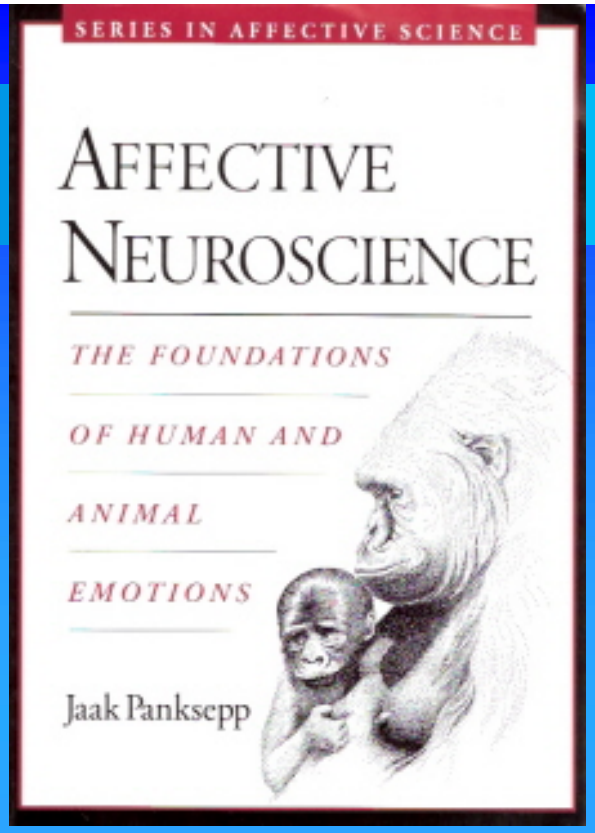
I. Basic Principles of Infant Rights (Birth to three years of age)

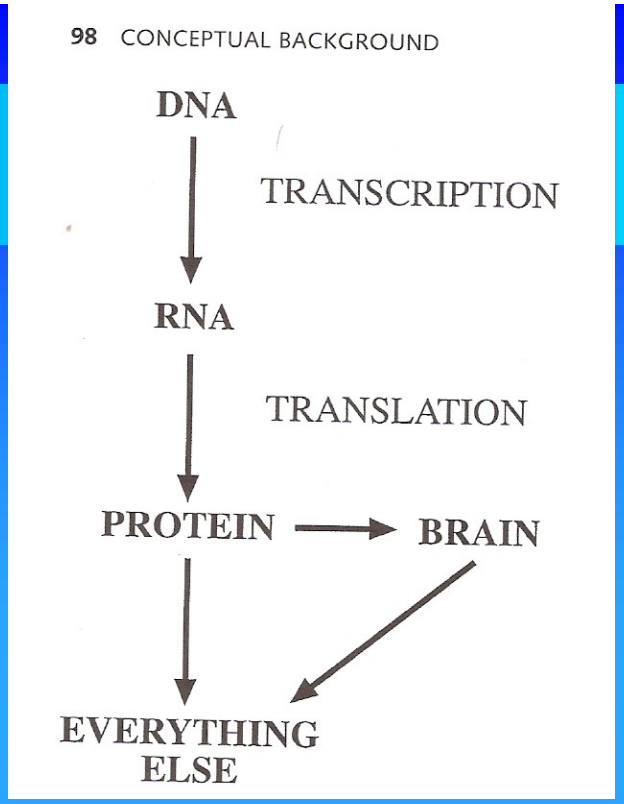
1. The Infant by reason of his/her physical and mental immaturity and absolute dependence needs special safeguards and care, including appropriate legal protection.

2. Infants with life-limiting conditions need access to palliative services, based on the same standards that stand in the society for older children.

3. The Infant is to be considered as a vital member of his/her family, registered as a citizen, and having the right for identity from the moment of birth. Moreover, the infant's status of a person is to include equal value for life regardless of gender or any individual characteristics such as those of disability.

4. The Infant has the right to be given nurturance that includes love, physical and emotional safety, adequate nutrition and sleep, in order to promote normal development.





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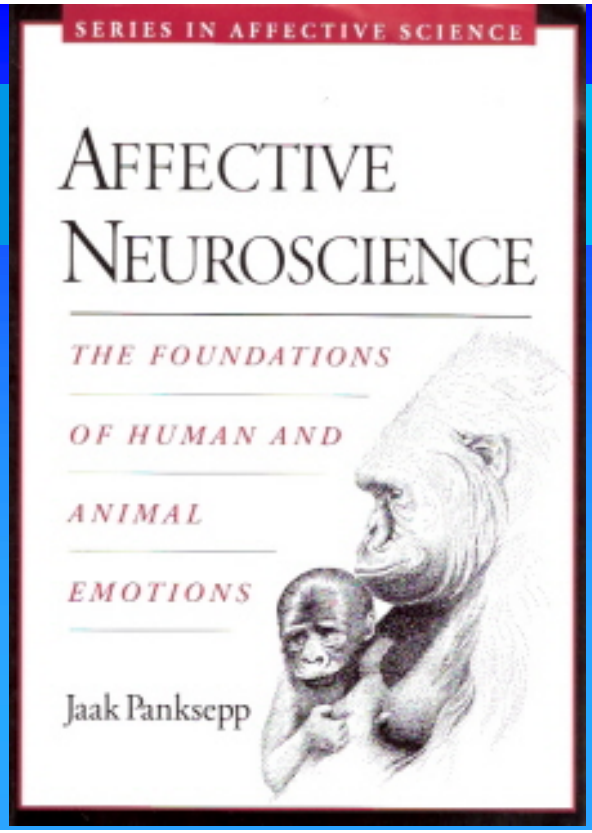

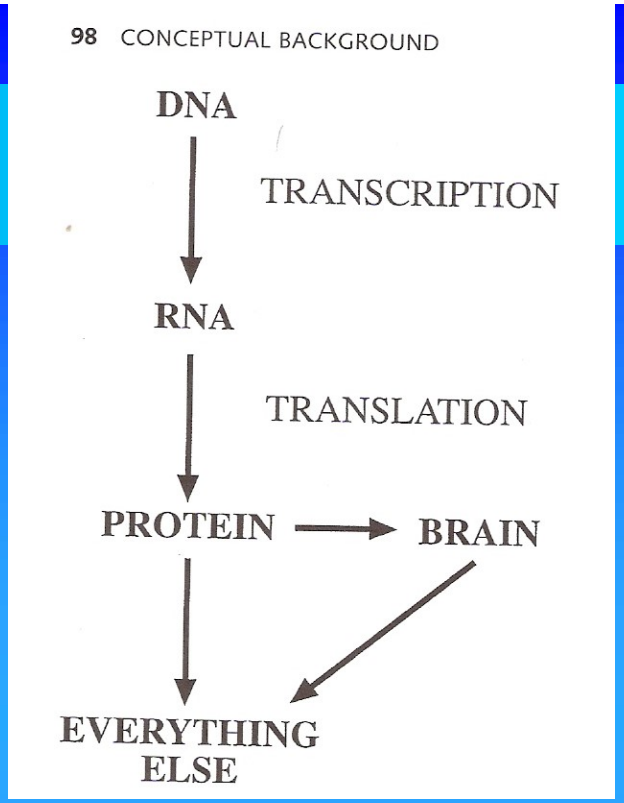

Figure 6.1. Summary of the current "central dogma" that underlies the analysis of all biological processes, including those that mediate basic psychobiological processes. The only major concept missing from this schematic is the environment, and these influences permeate all phases of these transactions.

The Neuroscience

The DNA → The Brain → Behaviour

EPIGENETICS NEURODEVELOPMENT EVOLUTIONARY BIOLOGY

ENVIRONMENT ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS

The Neuroscience

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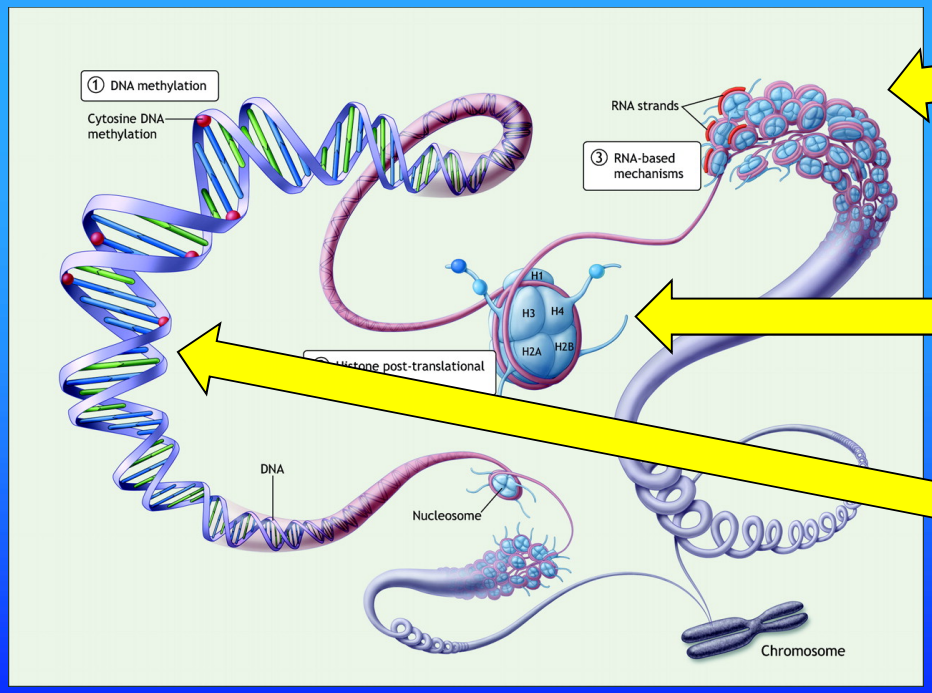

MICRO-RNA

HISTONE MODIFICATION

DNA METHYLATION

The Neuroscience of Birth & Breastfeeding

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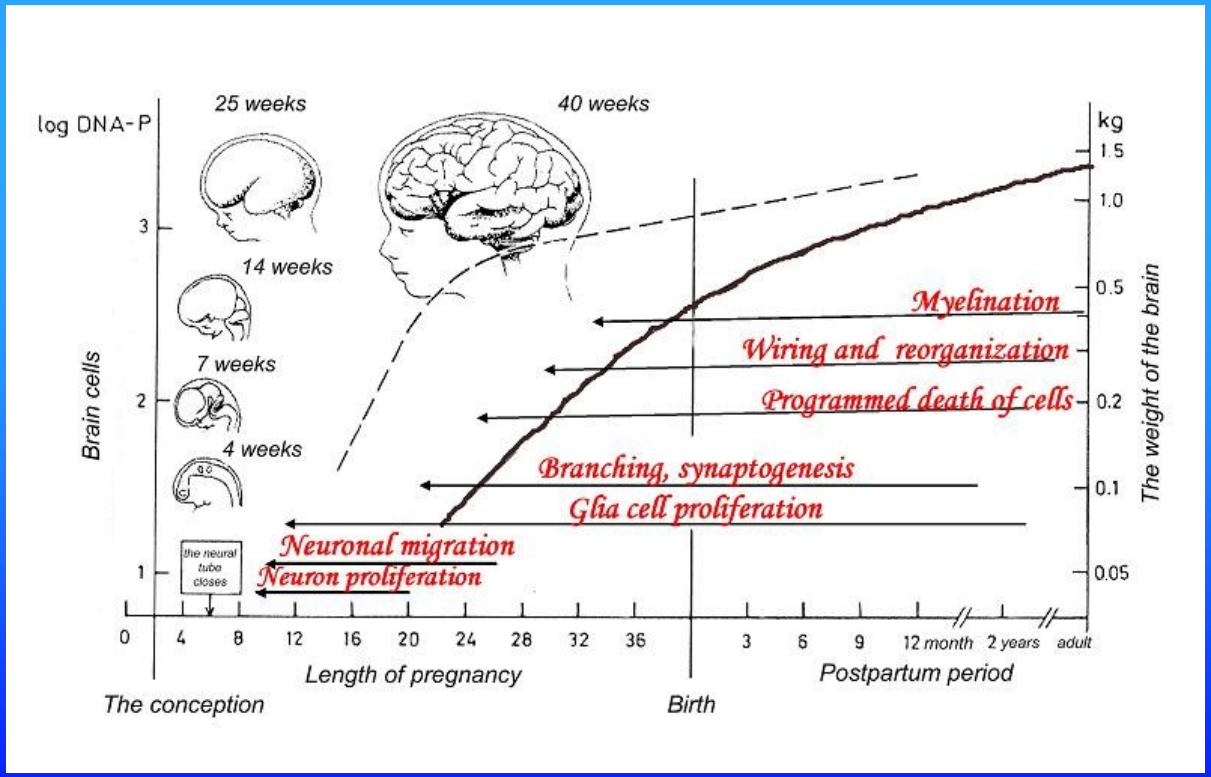
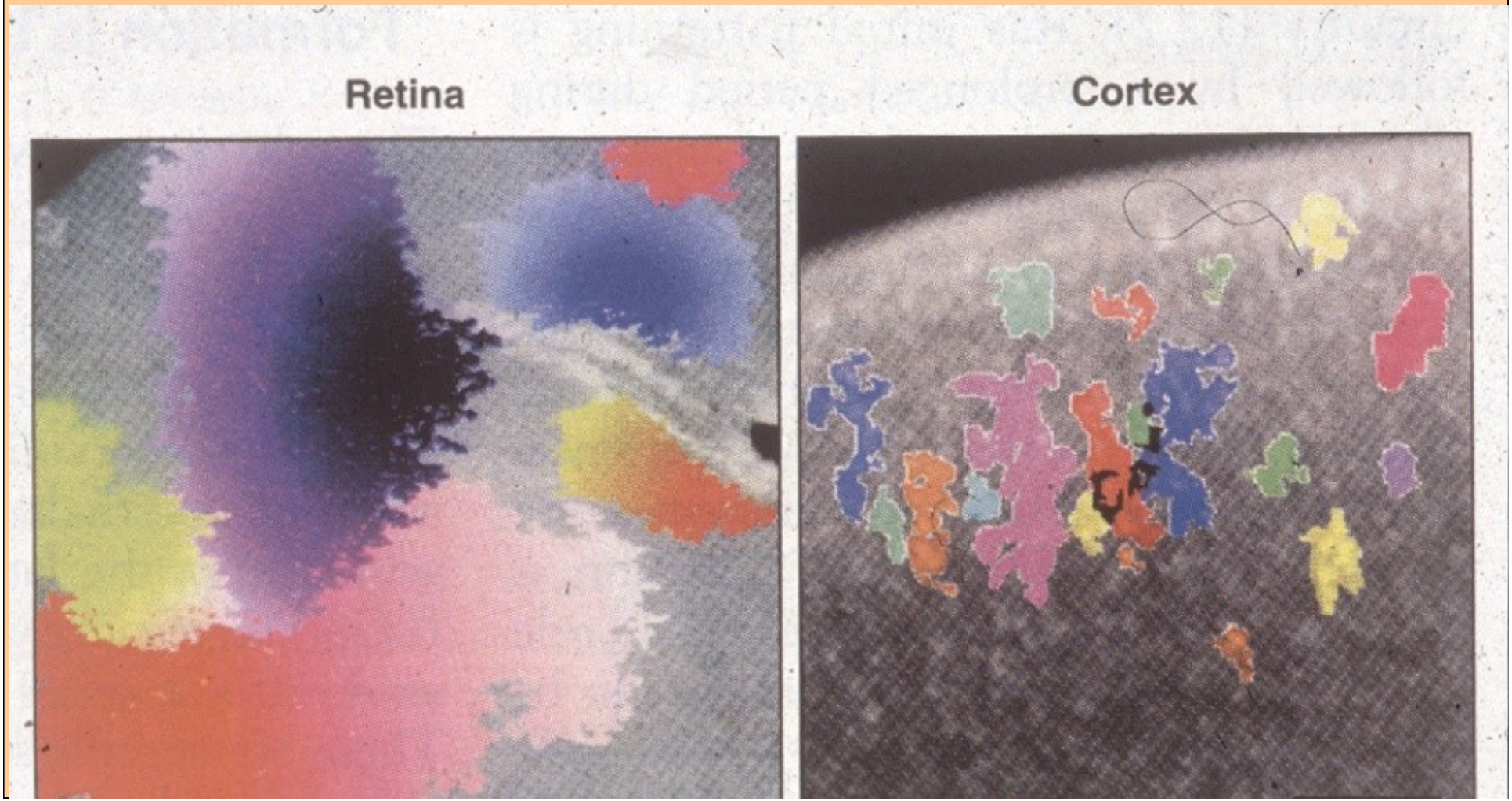
ENVIRONMENT ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS



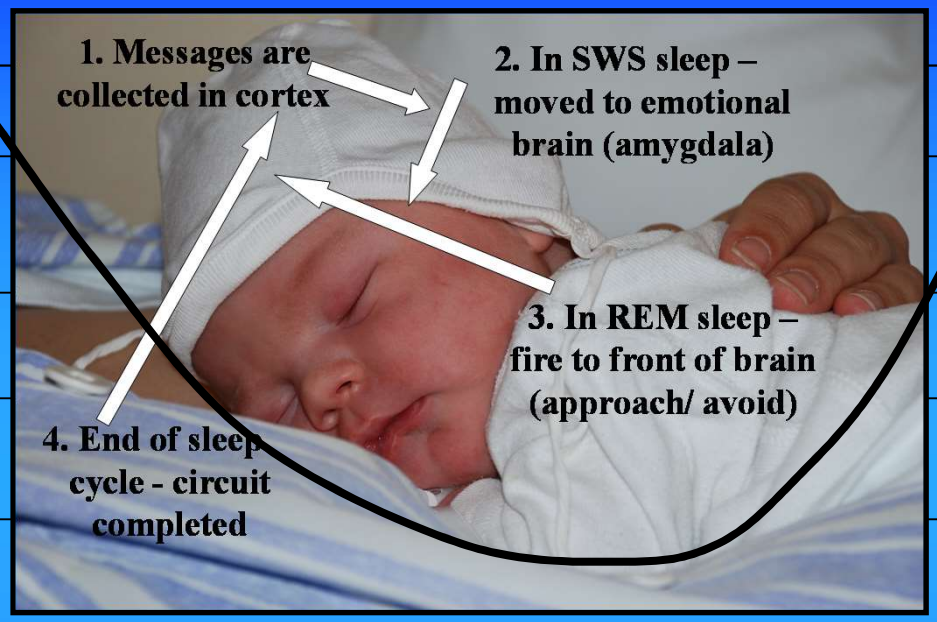
”Neurons that fire together wire together while those which don’t,won’t”

Hebb/Carla Shatz



SLEEP CYCLING - BRAIN WIRING

REM
NR1
NR2
NR3
SWS



ACQUISITION

poly-sensory input
short-term memory
stored cortex

Awake and REM

CONSOLIDATION

transfer information
"SNR" strong signals
amygdala /
hippocampus
NREM stage 4

MEMORY FORMATION

P waves
returns info
to neocortex:
organized
REM

SMELL

<u>modulates state organisation</u>

elicits emotional behaviours

activates pre-feeding actions
anticipatory digestive physiology
regulates pace of ingestive behaviour

Schaal 2004

SMELL → BRAIN WIRING

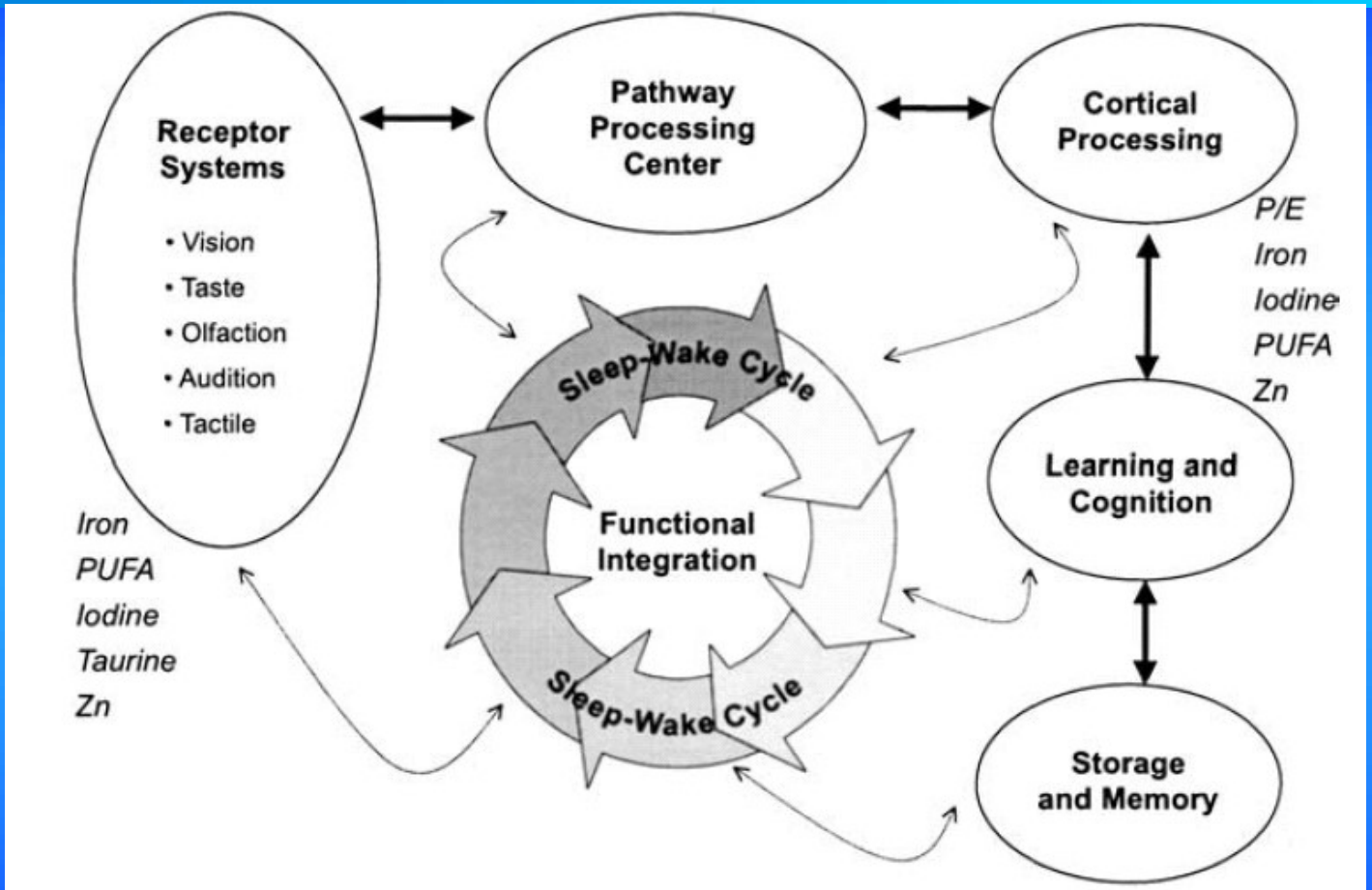
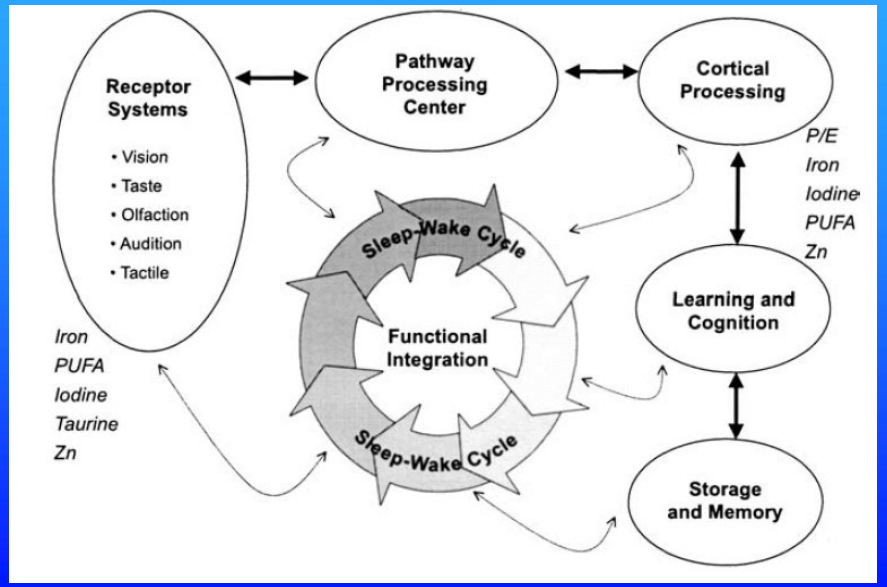


Fig 4. Schematic representation of the interaction between sensory receptors and CNS functions within the framework of the sleep-wake cycle. Nutrients with proven effects on sensory receptors and/or cortical processing are included (*PUFA*, polyunsaturated fatty acids; *Zn*, zinc; *P/E*, protein/energy).

Peirano 2003

Brain Architecture and Skills are Built in a Hierarchical "Bottom-Up" Sequence

- **Neural circuits that process basic information are wired earlier than those that process more complex information.**



Slide by: Jack P. Shonkoff, M.D.

Brain Architecture and Skills are Built in a Hierarchical "Bottom-Up" Sequence

- **Neural circuits that process basic information are wired earlier than those that process more complex information.**
- **Higher circuits build on lower circuits, and skill development at higher levels is more difficult if lower level circuits are not wired properly.**

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- Higher circuits build on lower circuits, and skill development at higher levels is more difficult if lower level circuits are not wired properly.

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HIGHLY CONSERVED
NEURO-ENDOCRINE
BEHAVIOR

"LIFE SCIENCES THEORY"

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ENVIRONMENT ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS

Newborn behaviour to locate the breast when skin-to-skin: a possible method for enabling early self-regulation

A-M Widström (ann-marie.widstrom@ki.se)[1], G Lilja[2], P Aaltomaa-Michalias[3], A Dahllöf[3], M Lintula[4], E Nissen[1,5]

DOI:10.1111/j.1651-2227.2010.01983.x

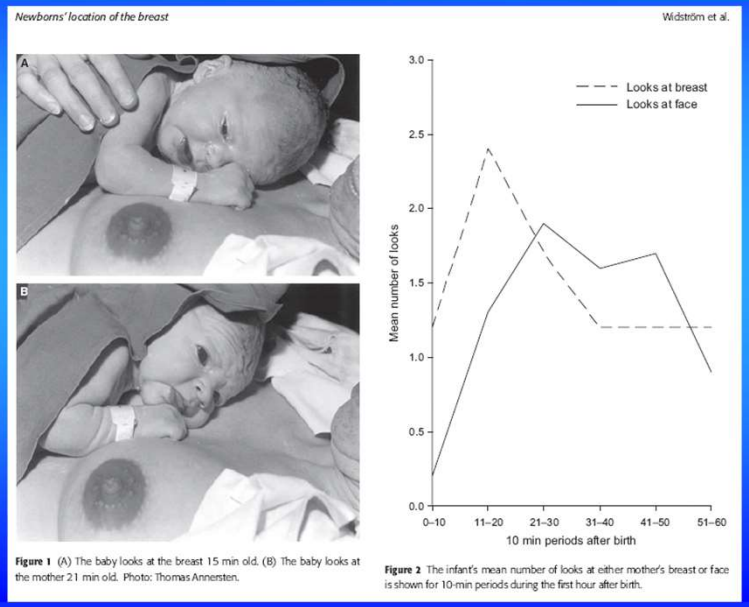

Figure 1 (A) The baby looks at the breast 15 min old. (B) The baby looks at the mother 21 min old. Photo: Thomas Annersten.

Figure 2 The infant's mean number of looks at either mother's breast or face is shown for 10-min periods during the first hour after birth.

Table 1 Definition of phases/behaviours identified

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

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"For species such as primates, the mother IS the environment."

Sarah Blaffer Hrdy, Mother Nature (1999)

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

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except in light of mother's body

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ENVIRONMENT

SKIN-TO-SKIN CONTACT

Skin-to-skin contact

except in light of mother's body

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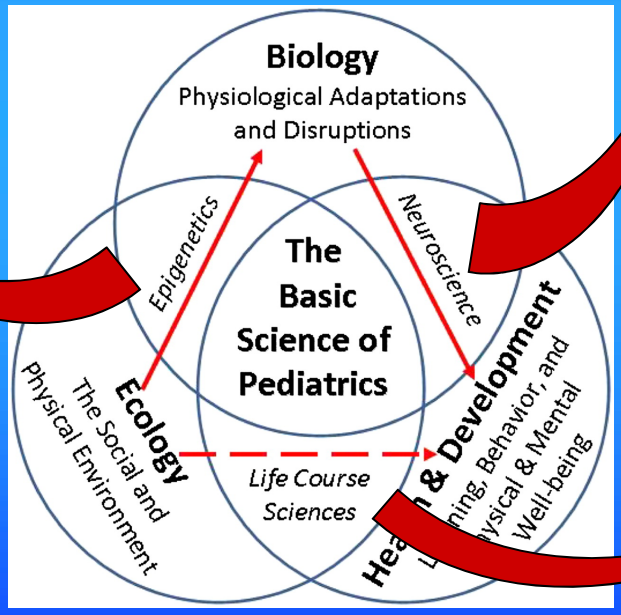

except in light of mother's body

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TECHNICAL REPORT

The Lifelong Effects of Early Childhood Adversity and Toxic Stress

Jack P. Shonkoff, Andrew S. Garner, THE COMMITTEE ON PSYCHOSOCIAL ASPECTS OF CHILD AND FAMILY HEALTH, COMMITTEE ON EARLY CHILDHOOD, ADOPTION, AND DEPENDENT CARE, AND SECTION ON DEVELOPMENTAL AND BEHAVIORAL PEDIATRICS, Benjamin S. Siegel, Mary I. Dobbins, Marian F. Earls, Andrew S. Garner, Laura McGuinn, John Pascoe and David L. Wood

Pediatrics 2012;129;e232; originally published online December 26, 2011; DOI: 10.1542/peds.2011-2663

INTRODUCTION

Of a good beginning cometh a good end.

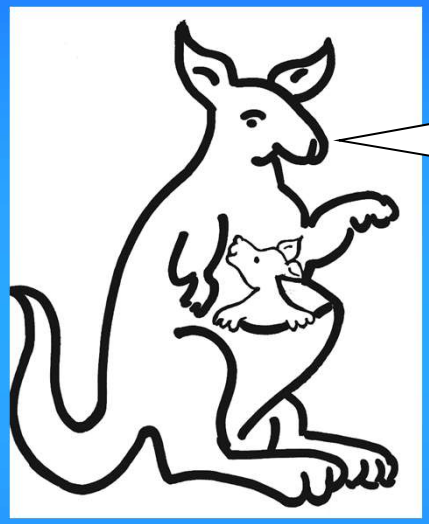
John Heywood, *Proverbs* (1546)

Shonkoff 2012

The United States, like all nations of the world, is facing a number of social and economic challenges that must be met to secure a promising future. Central to this task is the need to produce a well-

"Of a good beginning cometh a good end"

John Heywood, Proverbs (1546)



When is the beginning?

INTRODUCTION

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John Heywood, *Proverbs* (1546)

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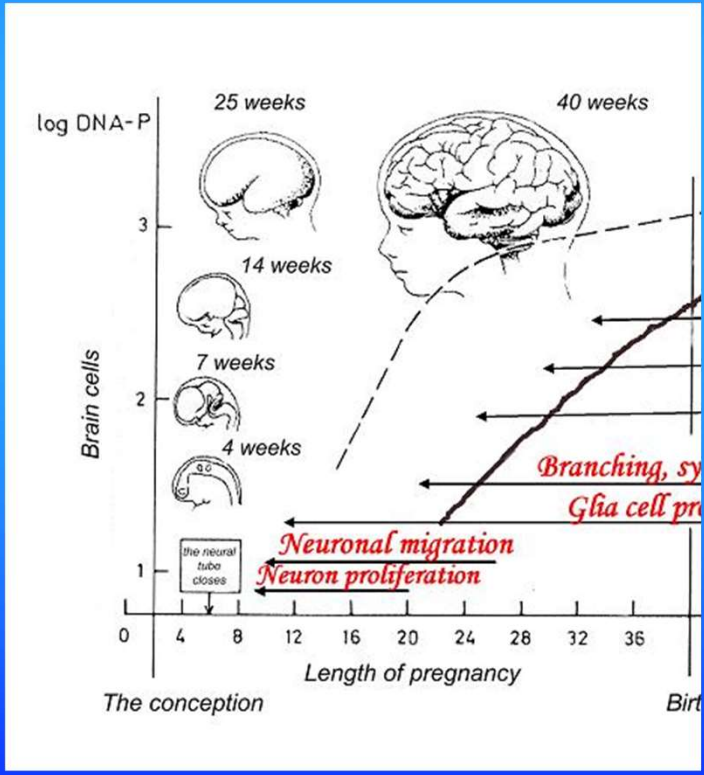
EARLY CHILDHOOD DEVELOPMENT ECD

"First 1000 days" =

gestation	270
year one	365
year two	365
total	1000 days



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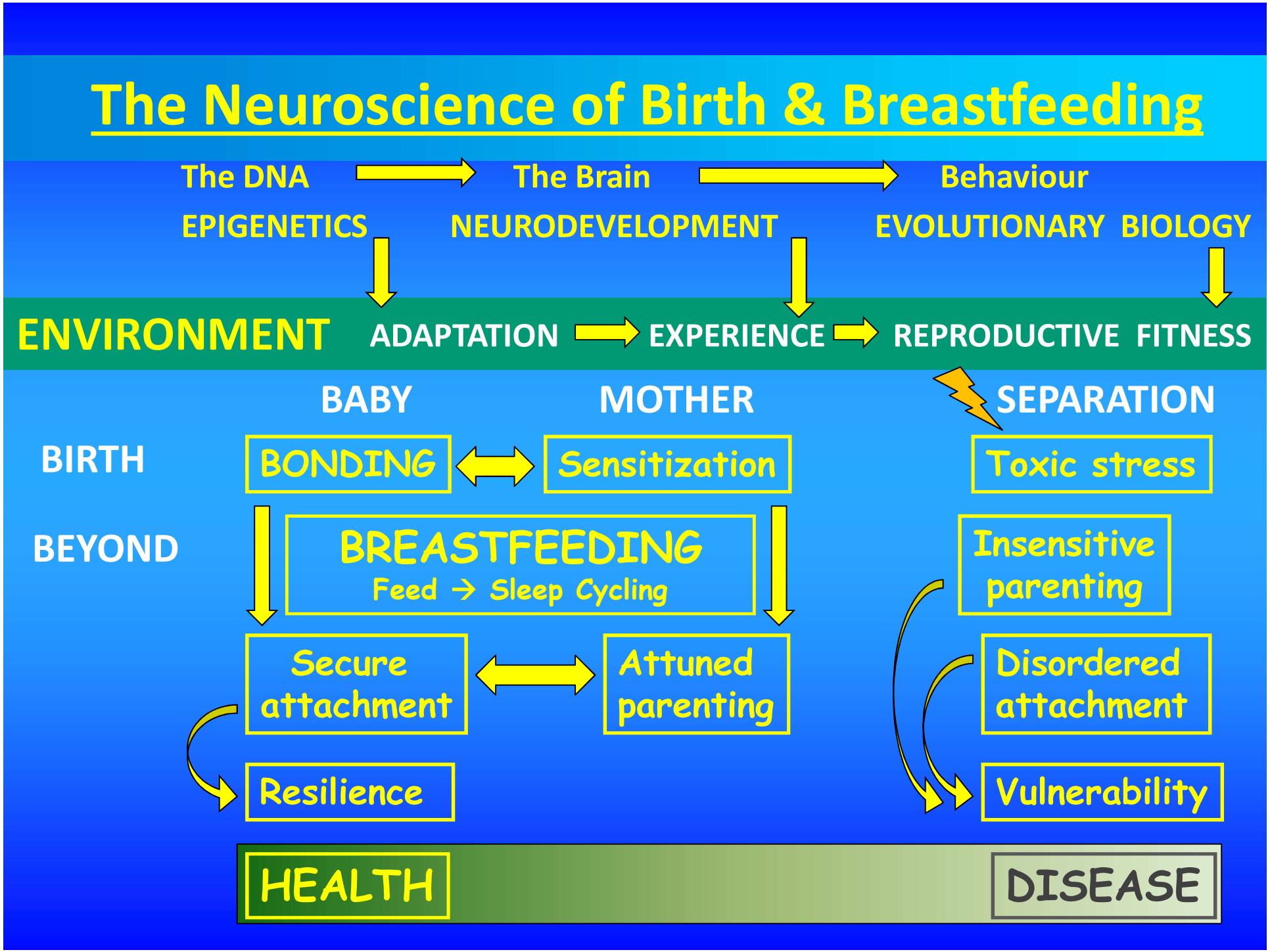
The Neuroscience of Birth & Breastfeeding
The DNA
EPIGENETICS
The Brain
NEURODEVELOPMENT
Behaviour
EVOLUTIONARY BIOLOGY
ENVIRONMENT
ADAPTATION
EXPERIENCE
REPRODUCTIVE FITNESS
BABY
MOTHER
SEPARATION
BIRTH
BONDING
Sensitization
Toxic stress
BEYOND
BREASTFEEDING
Feed → Sleep Cycling
Insensitive parenting
Secure attachment
Attuned parenting
Disordered attachment
Resilience
Vulnerability
HEALTH
DISEASE

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ENVIRONMENT → ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS

BIRTH

TRANSITION

… to extra-uterine life

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EPIGENETICS — NEURODEVELOPMENT — EVOLUTIONARY BIOLOGY

ENVIRONMENT — SKIN-TO-SKIN CONTACT

BIRTH

TRANSITION

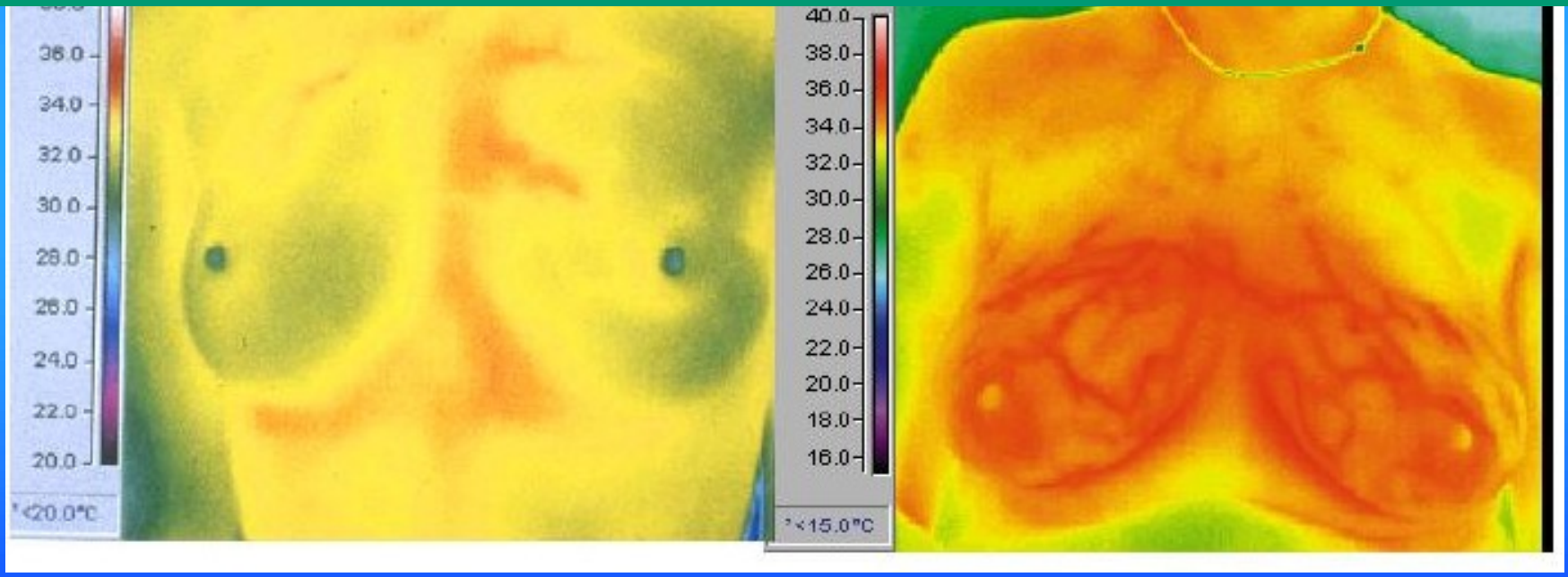
"The newborn may appear helpless, but

raises its own temperature, has a higher blood glucose, metabolic adaptation faster.

Thermal Images

Non-lactating Breasts **Lactating Breasts**

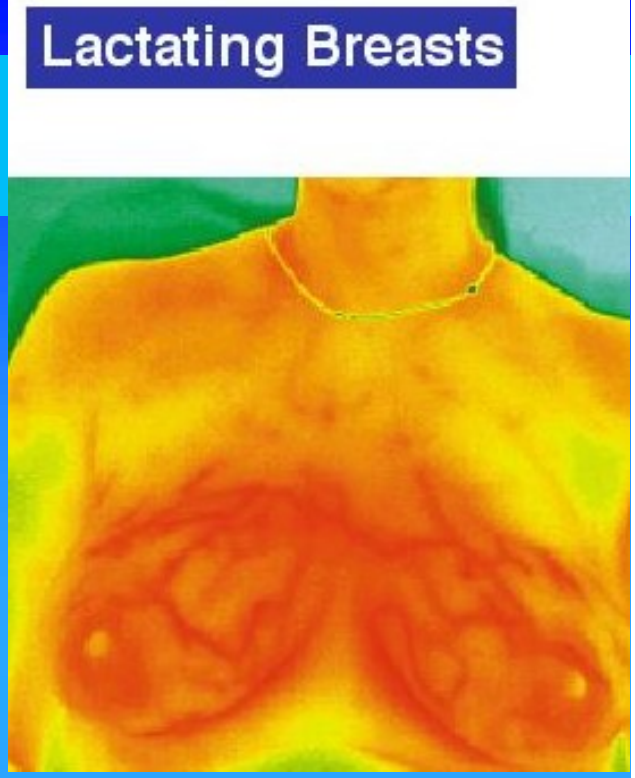
ENVIRONMENT **SKIN-TO-SKIN CONTACT**



Images courtesy of Prof Peter Hartmann, UWA

Warming,
feeding and
protection
behaviours are
intricately, inseparably
linked to the right place.

(Alberts 1994)



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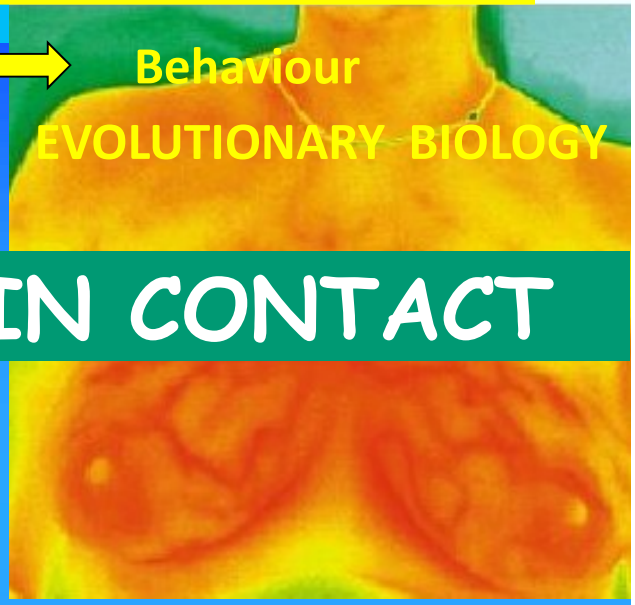

ENVIRONMENT

SKIN-TO-SKIN CONTACT

BIRTH

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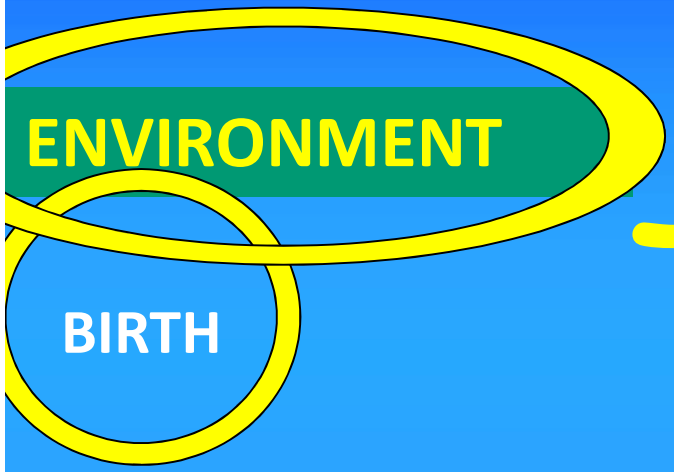

TRANSITION

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ACTA PÆDIATRICA
NURTURING THE CHILD

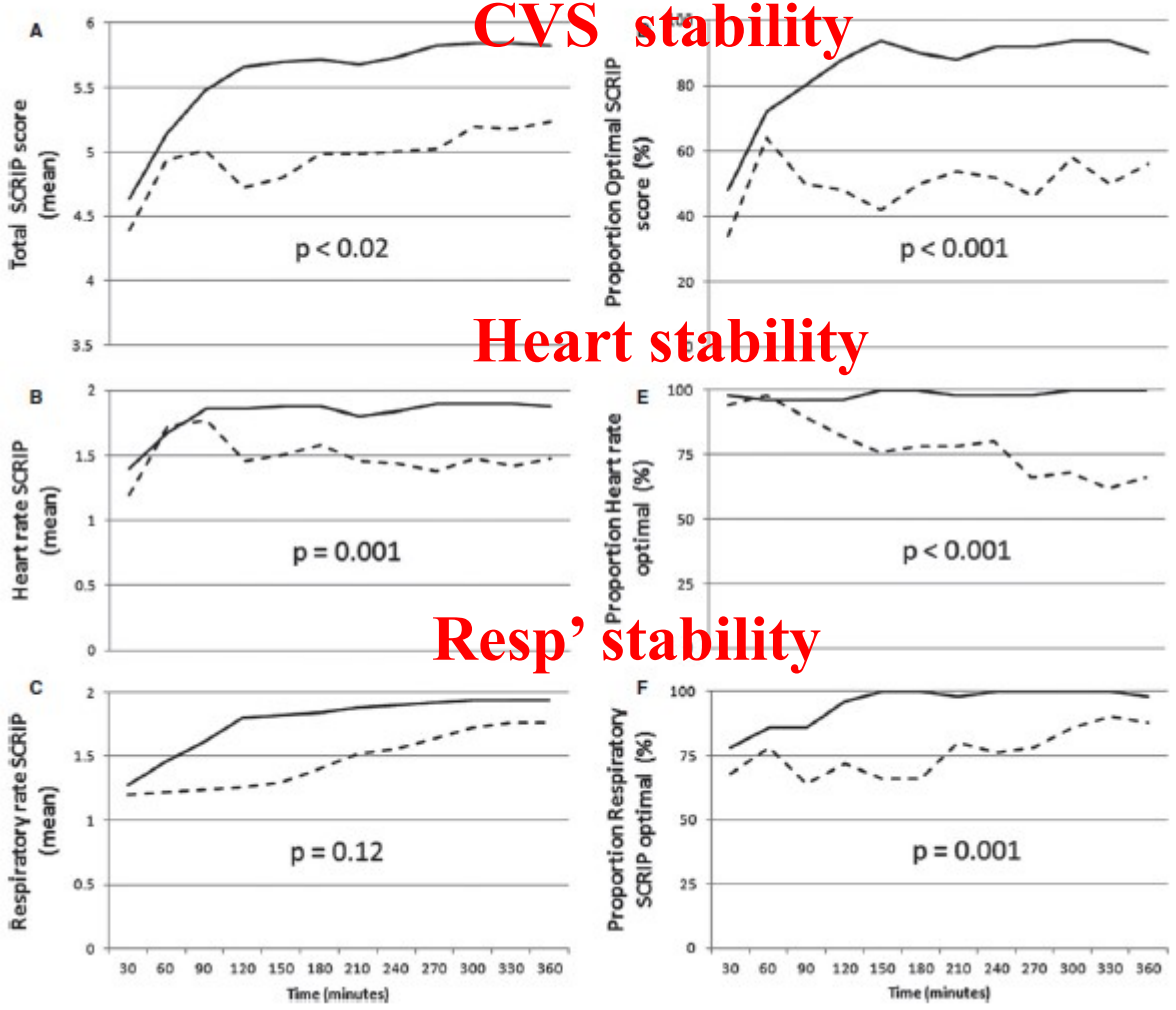
Acta Pædiatrica ISSN 0803-5253

REGULAR ARTICLE

Newly born low birthweight infants stabilise better in skin-to-skin contact than when separated from their mothers: a randomised controlled trial

Kim Chi Luong[1], Tien Long Nguyen[1,2], Duy Huong Huynh Thi[2], Henri P.O. Carrara[3], Nils J. Bergman (nils@kangaroomothercare.com)[4,5]

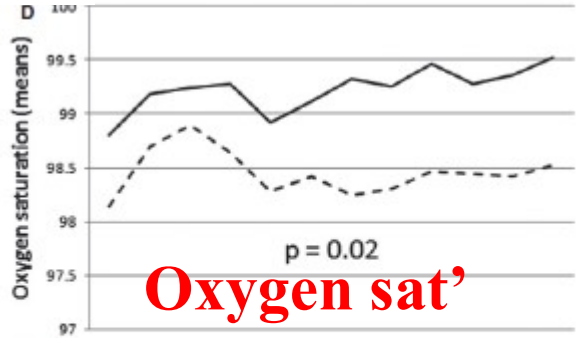
CVS stability



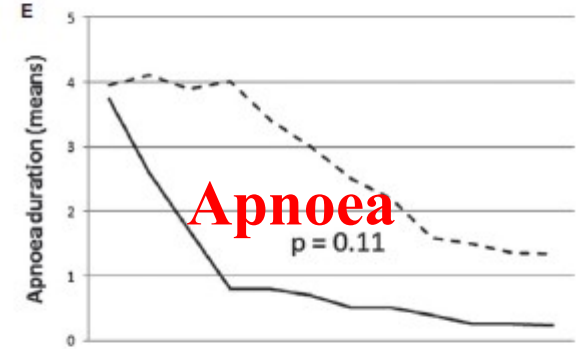
Heart stability

Resp' stability

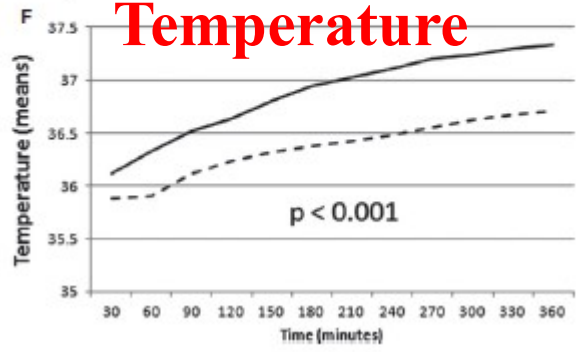
Oxygen sat'



Apnoea



Temperature



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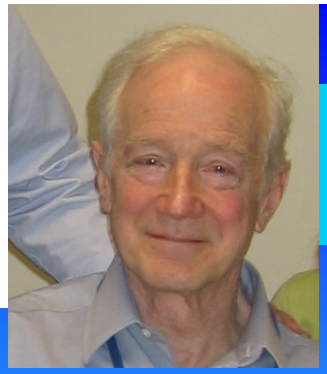
BIRTH

BABY

BONDING

Psychobiological Roots of Early Attachment

Myron A. Hofer



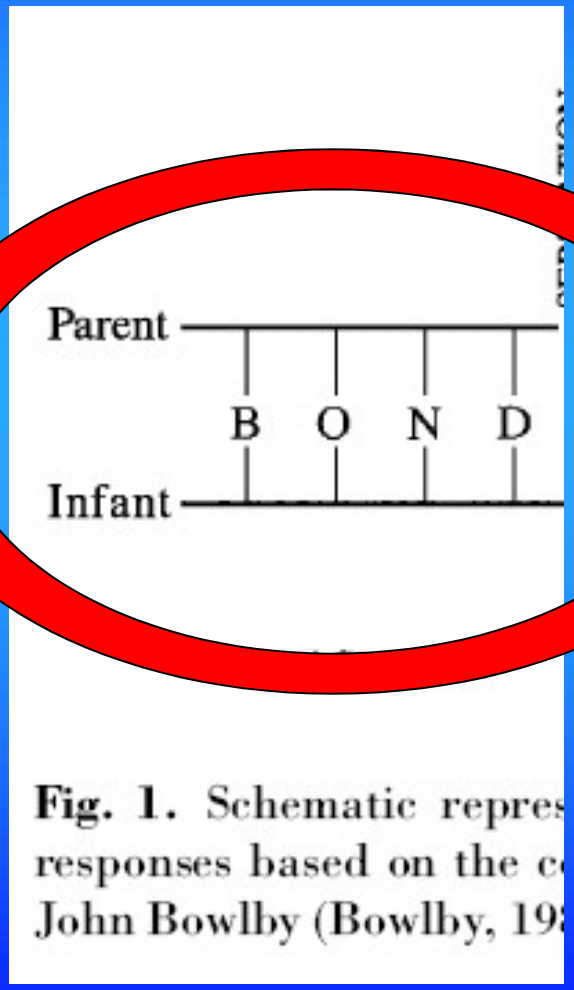


Fig. 1. Schematic repres
responses based on the c
John Bowlby (Bowlby, 19

REGULATION

The BOND
is made up of the
sensory inputs
from the parent
to the infant

Bowlby 1969, 1973, 1980

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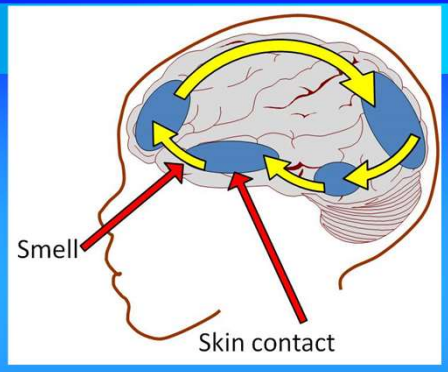
BABY

BIRTH — BONDING

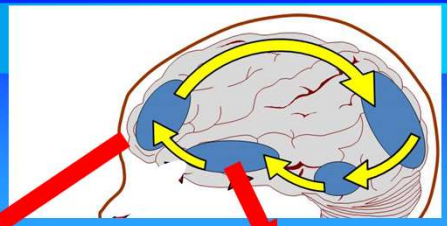
AT BIRTH,

the brain has TWO CRITICAL SENSORY NEEDS:



SMELL & CONTACT

connect direct to the amygdala



Prefrontal cortex
Executive function

AMYGDALA:
Emotional Processing Unit

CPU

SOCIAL and EMOTIONAL INTELLIGENCE

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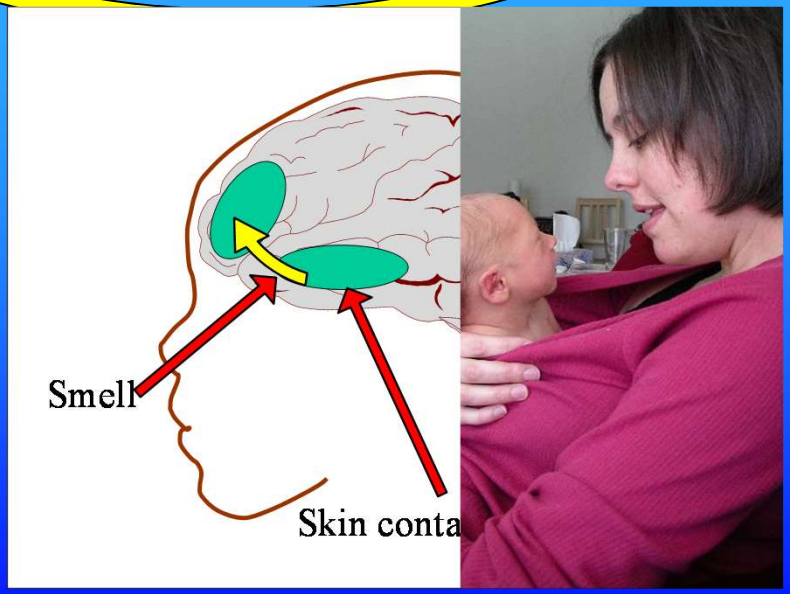
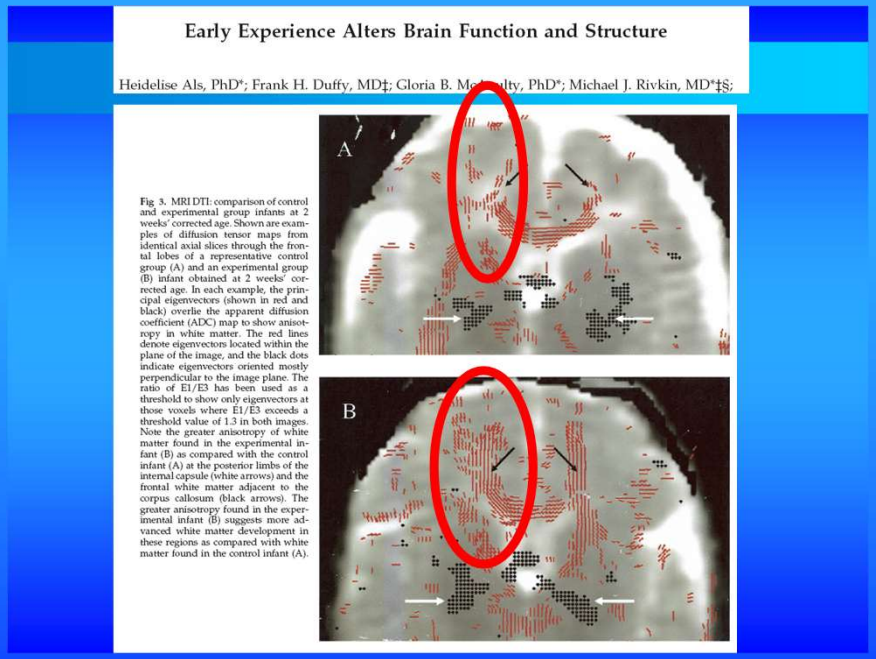
BONDING





Early Experience Alters Brain Function and Structure

Heidelise Als, PhD*; Frank H. Duffy, MD‡; Gloria B. Mc[illegible]lty, PhD*; Michael J. Rivkin, MD*‡§;

Fig 3. MRI DTI: comparison of control and experimental group infants at 2 weeks' corrected age. Shown are examples of diffusion tensor maps from identical axial slices through the frontal lobes of a representative control group (A) and an experimental group (B) infant obtained at 2 weeks' corrected age. In each example, the principal eigenvectors (shown in red and black) overlie the apparent diffusion coefficient (ADC) map to show anisotropy in white matter. The red lines denote eigenvectors located within the plane of the image, and the black dots indicate eigenvectors oriented mostly perpendicular to the image plane. The ratio of E1/E3 has been used as a threshold to show only eigenvectors at those voxels where E1/E3 exceeds a threshold value of 1.3 in both images. Note the greater anisotropy of white matter found in the experimental infant (B) as compared with the control infant (A) at the posterior limbs of the internal capsule (white arrows) and the frontal white matter adjacent to the corpus callosum (black arrows). The greater anisotropy found in the experimental infant (B) suggests more advanced white matter development in these regions as compared with white matter found in the control infant (A).

The Neuroscience of Birth & Breastfeeding

The DNA → The Brain → Behaviour

EPIGENETICS — NEURODEVELOPMENT — EVOLUTIONARY BIOLOGY

ENVIRONMENT → ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS

BABY

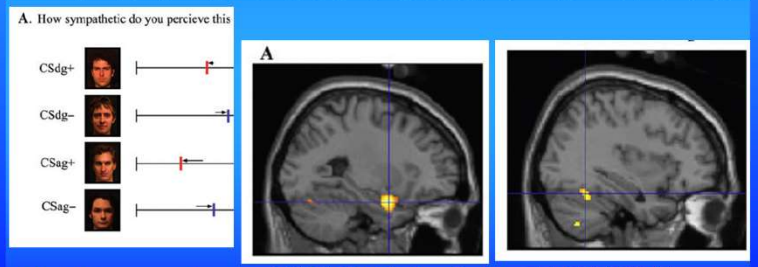
BIRTH

BONDING

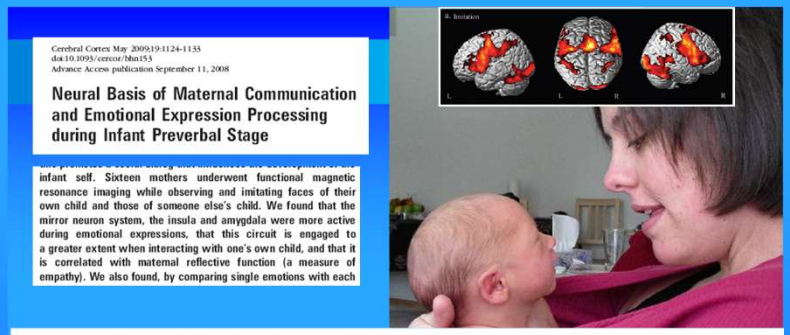
Learning affective values for faces is expressed in amygdala and fusiform gyrus

Predrag Petrovic, Raffael Kalisch, Mathias Pessiglione, Tania Singer, and Raymond J. Dolan
Wellcome Trust Centre for Neuroimaging, University College of London, 12 Queen Square, London, WC1N 3BG, UK

To monitor the environment for social threat humans must build affective evaluations of others. These evaluations are malleable and to a high degree shaped by responses engendered by specific social encounters. The precise neuronal mechanism by which these evaluations are constructed is poorly understood. We tested a hypothesis that conjoint activity in amygdala and fusiform



Morphing emotion — AMYGDALA ↔ FUSIFORM GYRUS



Cerebral Cortex May 2009;19:1124-1133
doi:10.1093/cercor/bhn153
Advance Access publication September 11, 2008

Neural Basis of Maternal Communication and Emotional Expression Processing during Infant Preverbal Stage

infant self. Sixteen mothers underwent functional magnetic resonance imaging while observing and imitating faces of their own child and those of someone else's child. We found that the mirror neuron system, the insula and amygdala were more active during emotional expressions, that this circuit is engaged to a greater extent when interacting with one's own child, and that it is correlated with maternal reflective function (a measure of empathy). We also found, by comparing single emotions with each

As predicted, imitation and observation of facial expressions elicited activation of fronto-parietal mirror areas (vPMC-IFG-pars opercuralis and IPL), STS, anterior insula, and amygdala.

Simulation theory:
EMPATHY is generated by inner imitation of actions of others

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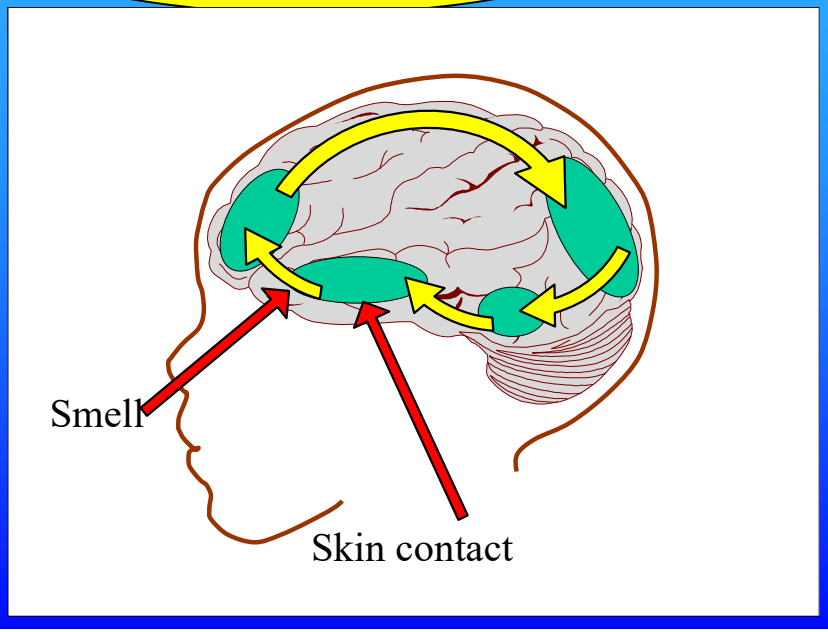
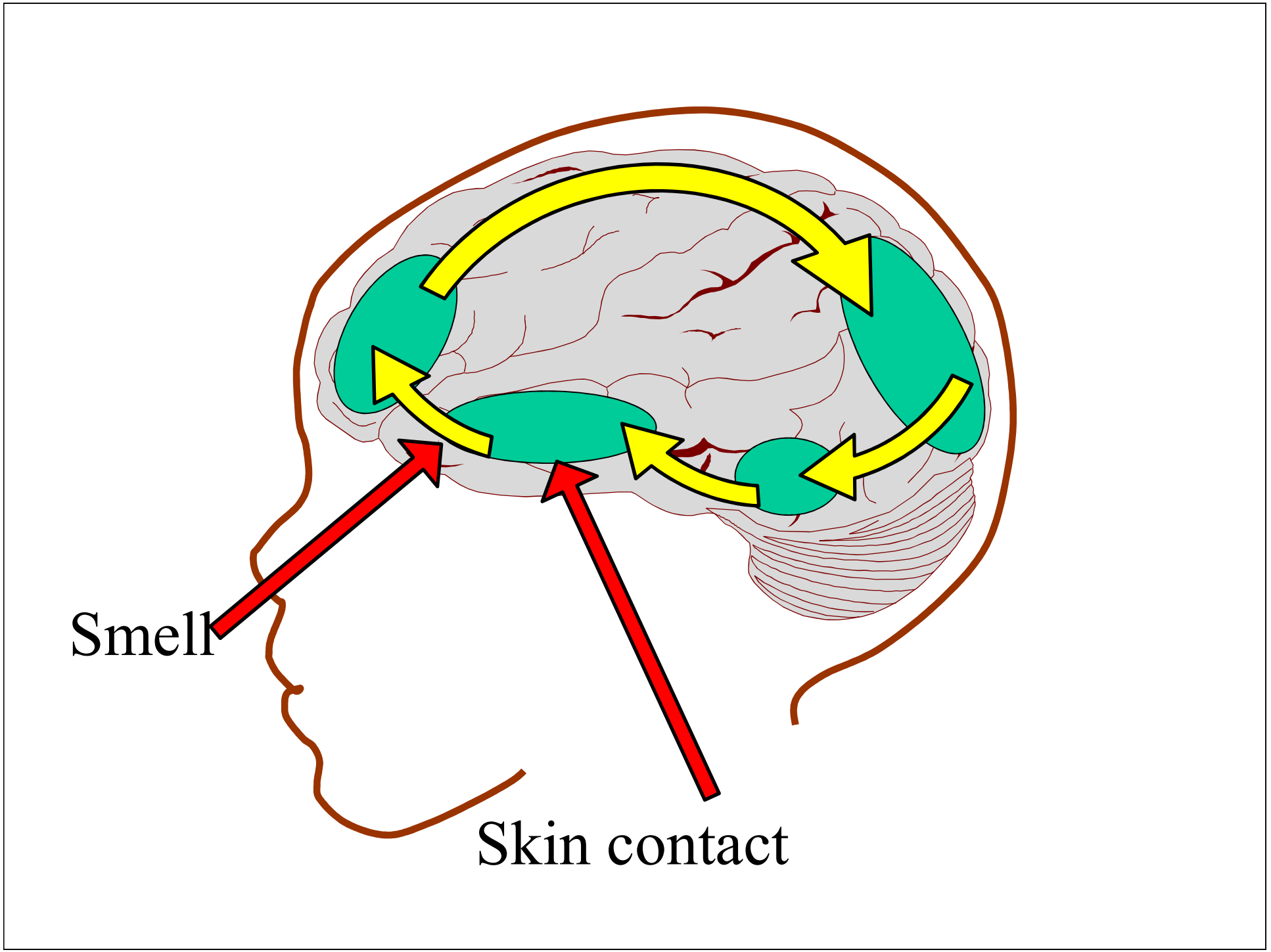
BABY

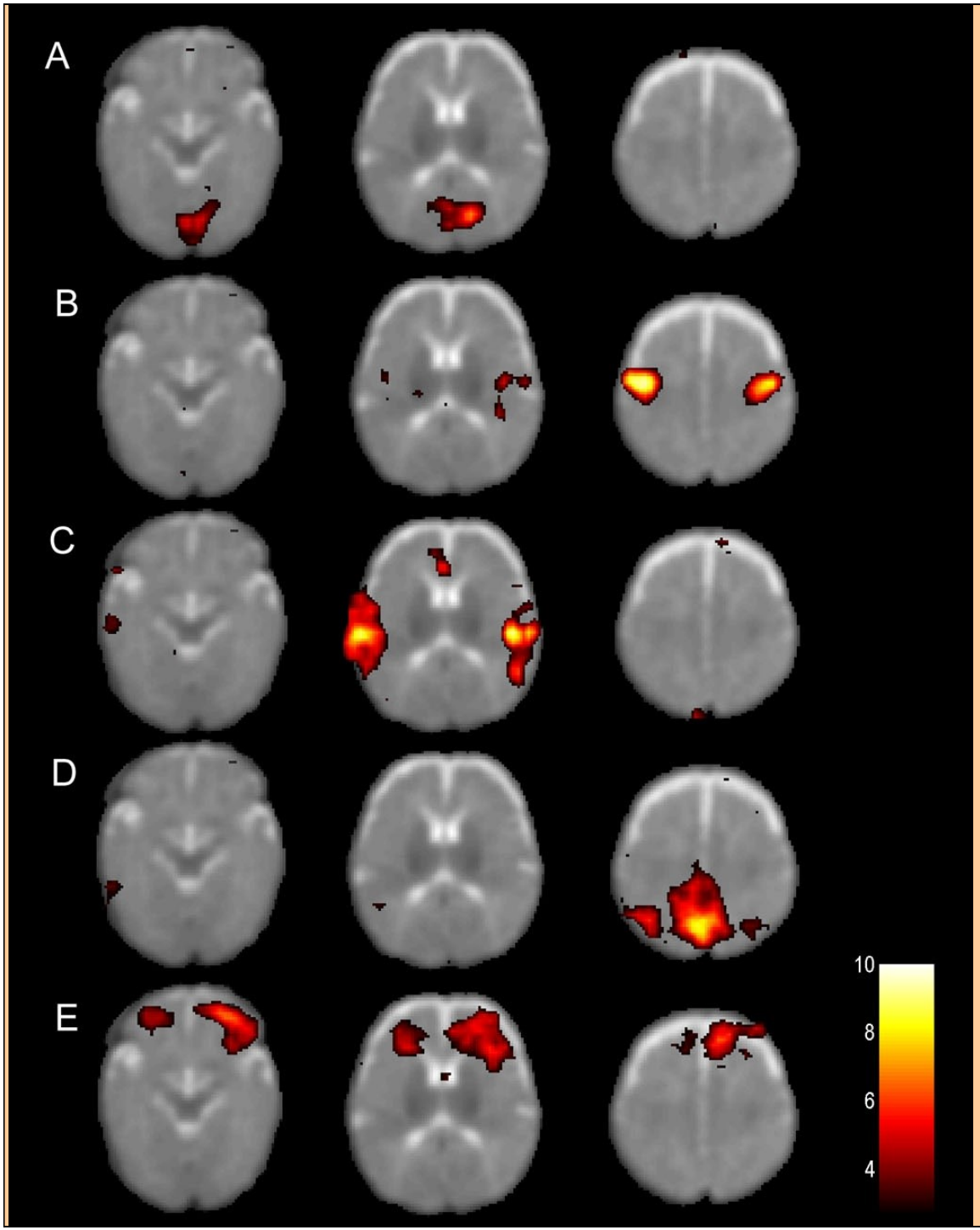
BIRTH — BONDING



In humans, oxytocin increases gaze to the eye region of human faces and enhances interpersonal trust and the ability to infer the emotions of others from facial cues.

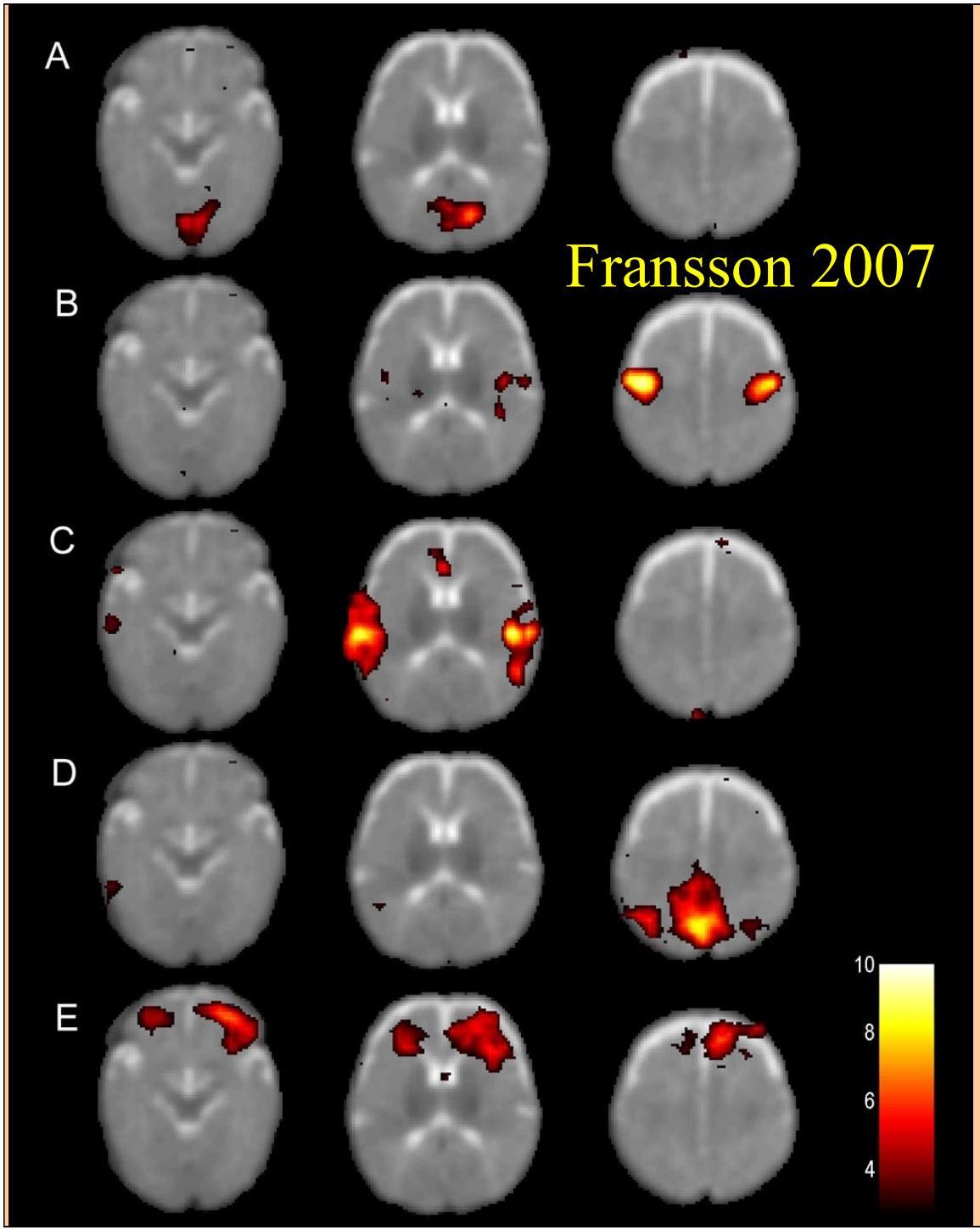
Simulation theory:
EMPATHY is generated
by inner imitation
of actions of others


Smell
Skin contact



The infant brain is not blank!
Resting activity
-
"stream of consciousness"

Fransson 2007



A primary visual areas,

B somatosensory motor cortex

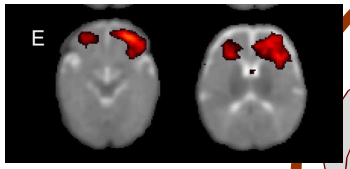
C primary auditory cortex

D parietal cortex & cerebellum

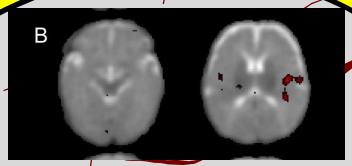
E m l anterior pre-frontal cortex

OXYTOCIN

EMOTION CONTROL CENTRE

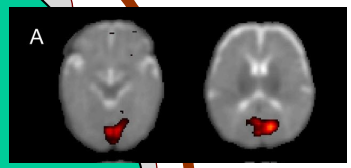


E prefrontal

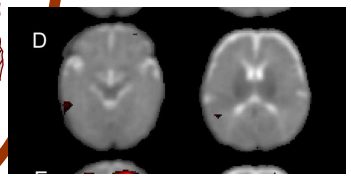


B somatosensory

A primary visual

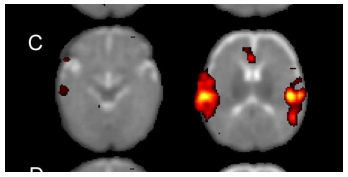


D parietal & cerebellum



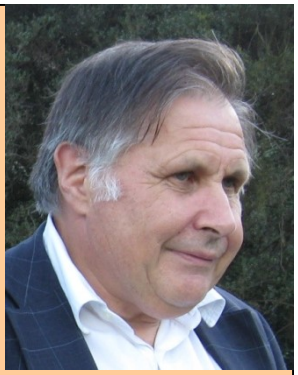
Smell

FACE RECOGNITION CENTRE



C primary auditory

Skin contact



Blank → Unknown face →

Karolinska Institutet

KAROLINSKA Universitetssjukhuset

Blank → Unknown face → Mother´s face

HOW EARLY SHOULD THE KANGAROO POSITION START?

ENVIRONMENT

SKIN-TO-SKIN CONTACT

BIRTH

BABY

BONDING

REGULATION

leads to …

BONDING

HOW EARLY SHOULD THE KANGAROO POSITION START?

ENVIRONMENT

SKIN-TO-SKIN CONTACT

BIRTH

BABY

BONDING

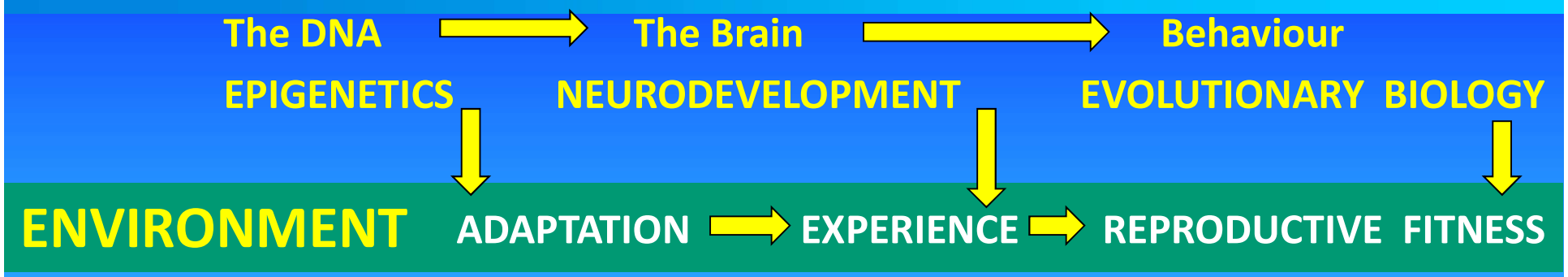
REGULATION

leads to …

BONDING

leads to …

The Neuroscience of Birth & Breastfeeding



BABY

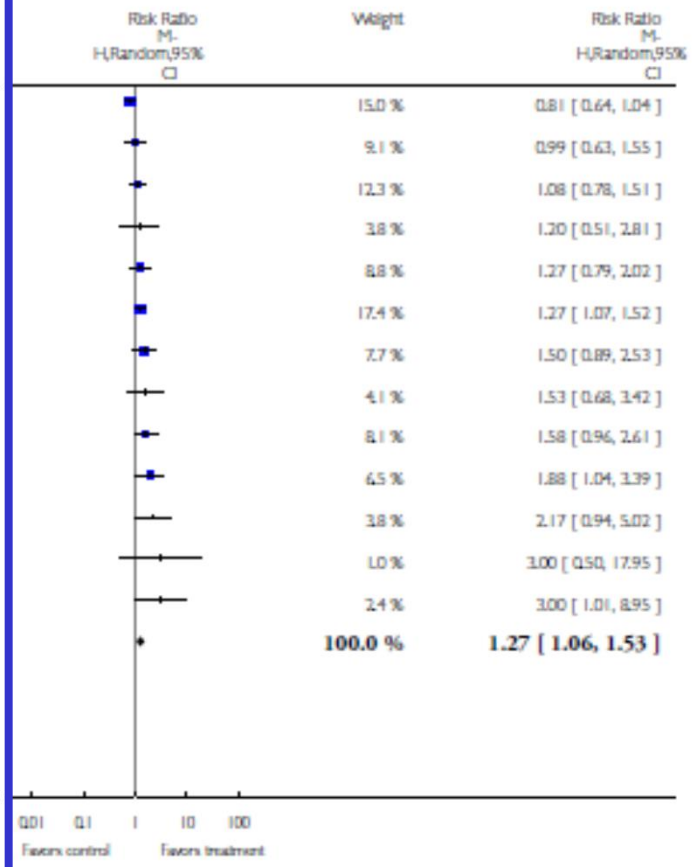
BIRTH — BONDING

BEYOND — BREASTFEEDING

Feed → Sleep Cycling

Analysis 1.1. Comparison 1 Skin-to-skin versus standard contact healthy infants, Outcome 1 Breastfeeding 1 month to 4 months postbirth.

Review: Early skin-to-skin contact for mothers and their healthy newborn infants



Early skin-to-skin contact for mothers and their healthy newborn infants (Review)

Moore ER, Anderson GC, Bergman N

THE COCHRANE COLLABORATION®

Skin-to-skin "causes" breastfeeding

Early skin-to-skin contact for mothers and their healthy newborn infants (Review)

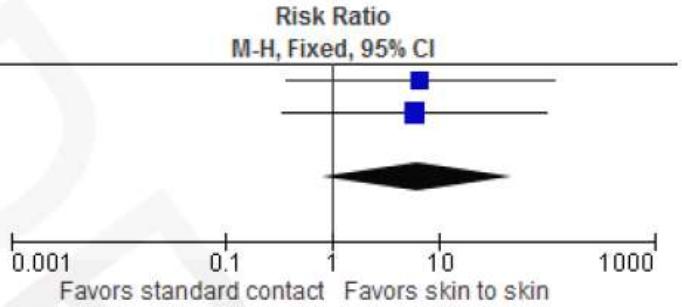
2016 update in press

1.9 Breastfeeding 1 year postbirth

Study or Subgroup	Treatment Events	Treatment Total	Control Events	Control Total	Weight	Risk Ratio M-H, Fixed, 95% CI
De Chateau 1977	3	16	0	15	45.9%	6.59 [0.37, 117.77]
Shiau 1997	4	19	0	12	54.1%	5.85 [0.34, 99.83]
Total (95% CI)		**35**		**27**	**100.0%**	**6.19 [0.82, 46.78]**
Total events	7		0			

Heterogeneity: Chi² = 0.00, df = 1 (P = 0.95); I² = 0%

Test for overall effect: Z = 1.77 (P = 0.08)

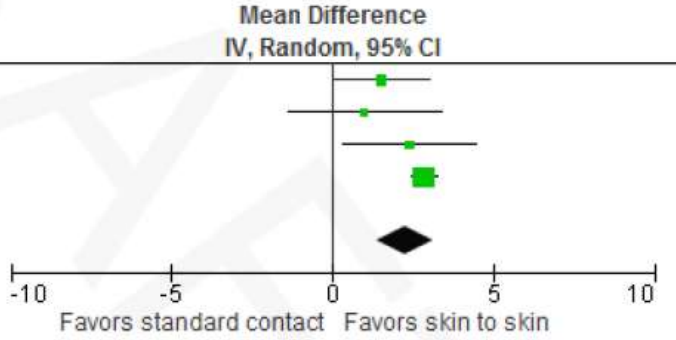


1.10 Success of the first breastfeeding (IBFAT score)

Study or Subgroup	Treatment Mean	Treatment SD	Treatment Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Random, 95% CI
Beiranvand 2014	8.76	3.63	46	7.25	3.5	44	22.1%	1.51 [0.04, 2.98]
Gouchon 2010	9.2	3.8	17	8.2	3.2	17	11.1%	1.00 [-1.36, 3.36]
Moore 2005	8.7	2.11	10	6.3	2.58	10	13.8%	2.40 [0.33, 4.47]
Srivastava 2014	9.55	1.14	122	6.71	1.9	118	53.0%	2.84 [2.44, 3.24]
Total (95% CI)			**195**			**189**	**100.0%**	**2.28 [1.41, 3.15]**

Heterogeneity: Tau² = 0.33; Chi² = 5.05, df = 3 (P = 0.17); I² = 41%

Test for overall effect: Z = 5.12 (P < 0.00001)



Skin-to-skin "causes" breastfeeding

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BABY

BIRTH

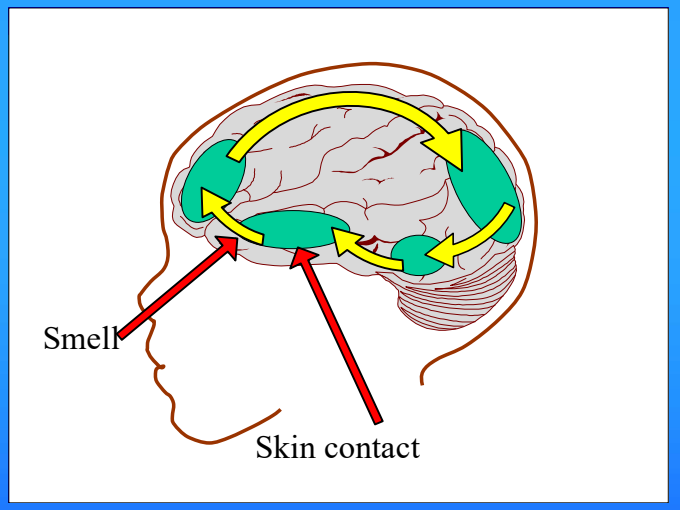
BONDING

BEYOND

BREASTFEEDING

Feed → Sleep Cycling

Secure attachment



Psychobiological Roots of Early Attachment

Myron A. Hofer

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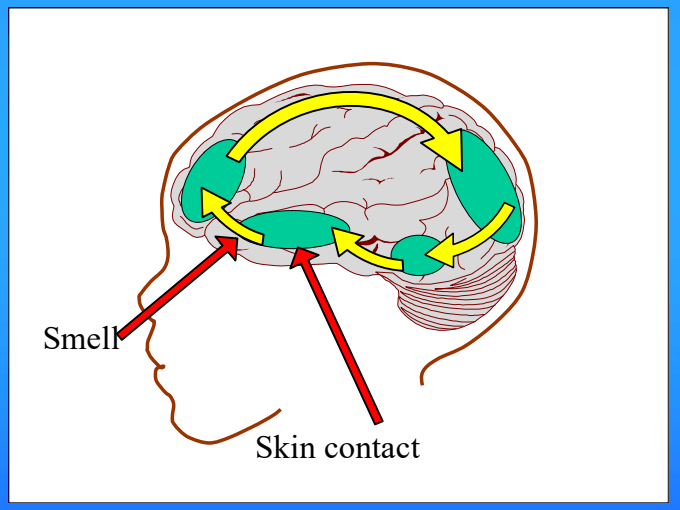
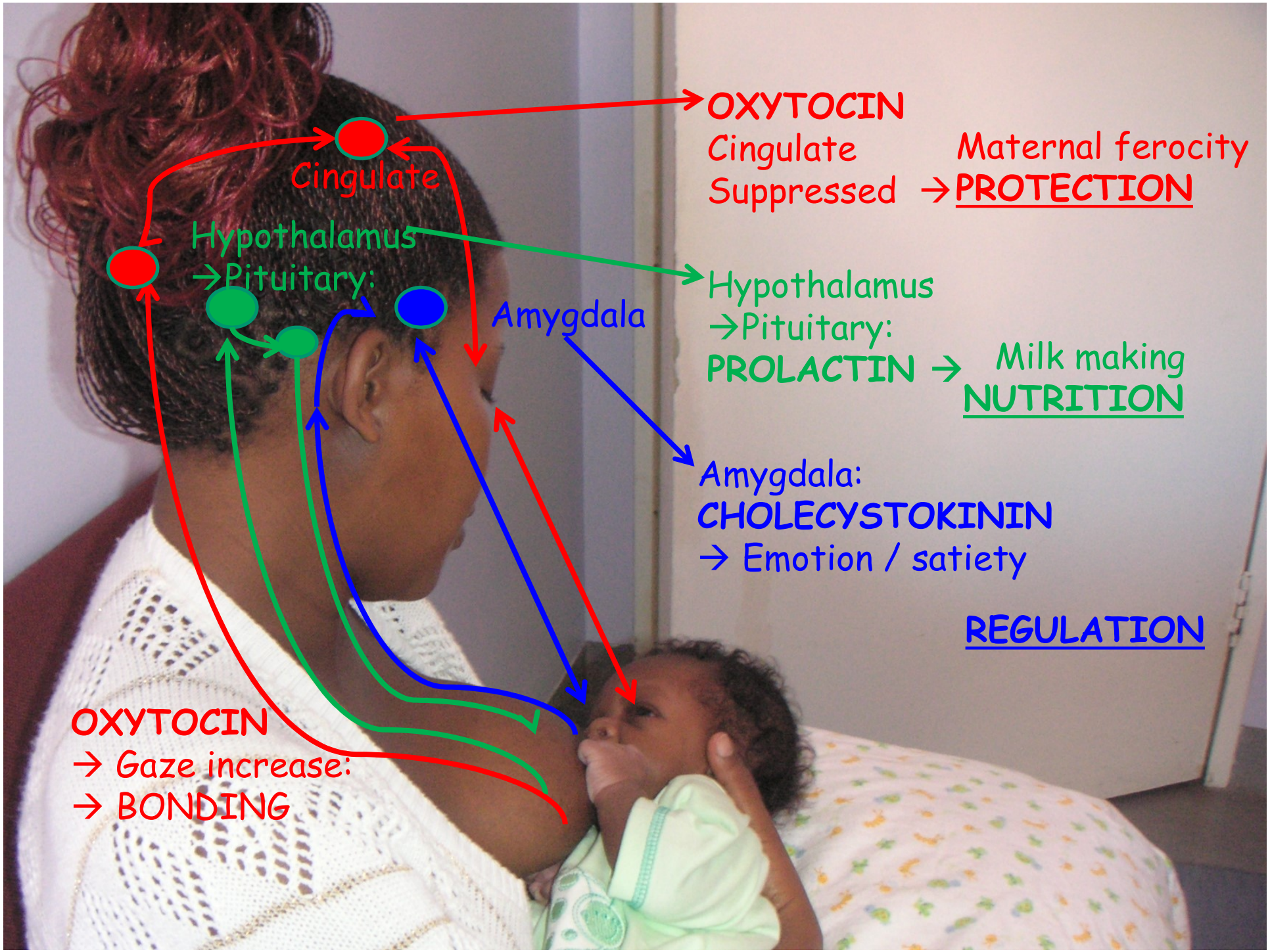
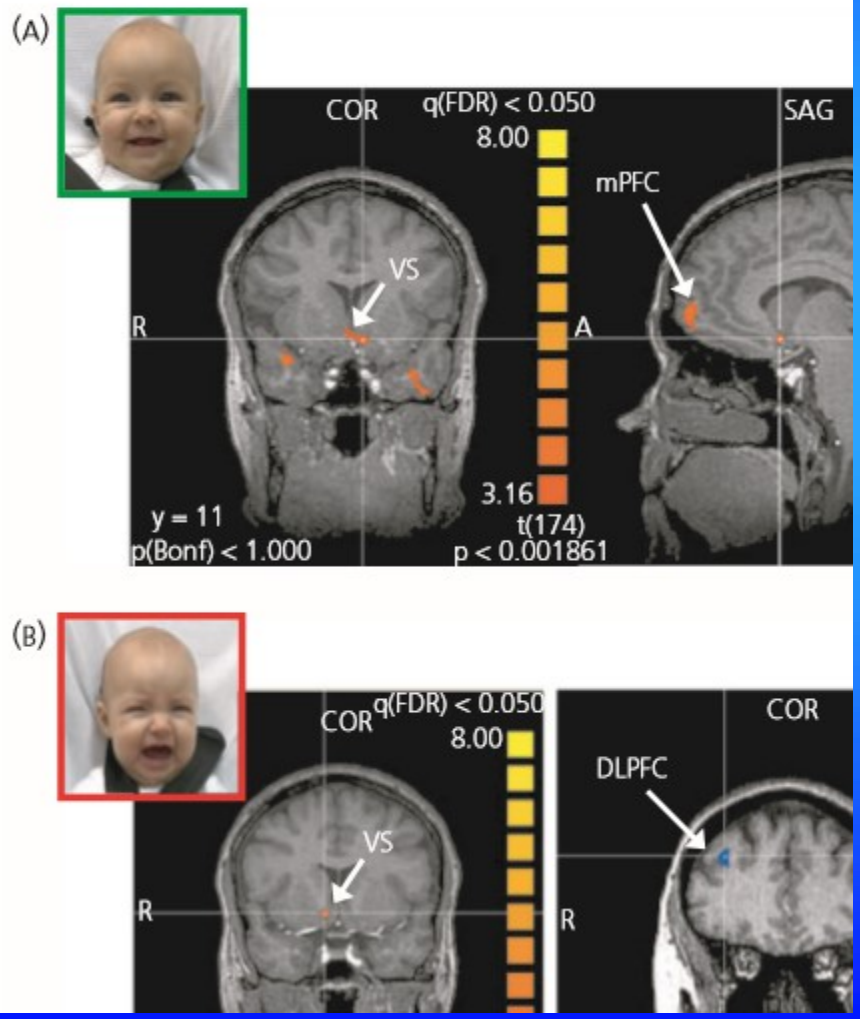
	BABY	MOTHER
BIRTH	BONDING ⟷	Sensitization
BEYOND	BREASTFEEDING Feed → Sleep Cycling	
	Secure attachment ⟷	Attuned parenting




Cingulate
Hypothalamus
→Pituitary:
Amygdala
OXYTOCIN
Cingulate
Suppressed
Maternal ferocity
→PROTECTION
Hypothalamus
→Pituitary:
PROLACTIN →
Milk making
NUTRITION
Amygdala:
CHOLECYSTOKININ
→ Emotion / satiety
REGULATION
OXYTOCIN
→ Gaze increase:
→ BONDING

How oxytocin and dopamine connect

From animal studies, we learn that oxytocinergic circuits are directly linked with the mesocorticolimbic dopamine pathway, with oxytocinergic neurones projecting from the hypothalamic PVN and MPOA to both the VTA and the VS (Fig. 3). The strength of these connections is associated with levels of maternal caregiving behav-

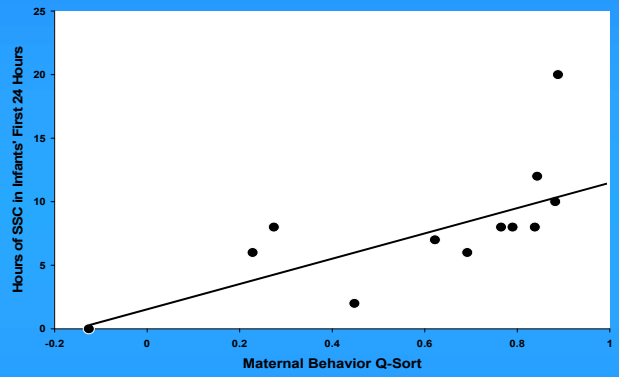


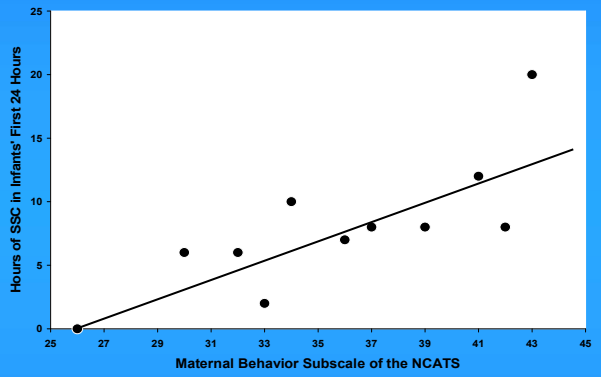
… infant cues - suckling, vocalisation and tactile stimulation - stimulate **OXYTOCIN** release in the hypothalamus, which may result in the activation of the dopaminergic reward pathway leading to behavioural reinforcement

Dose of SCC first 24 hours correlates

Maternal behaviour Q Sort

Predicts attachment security





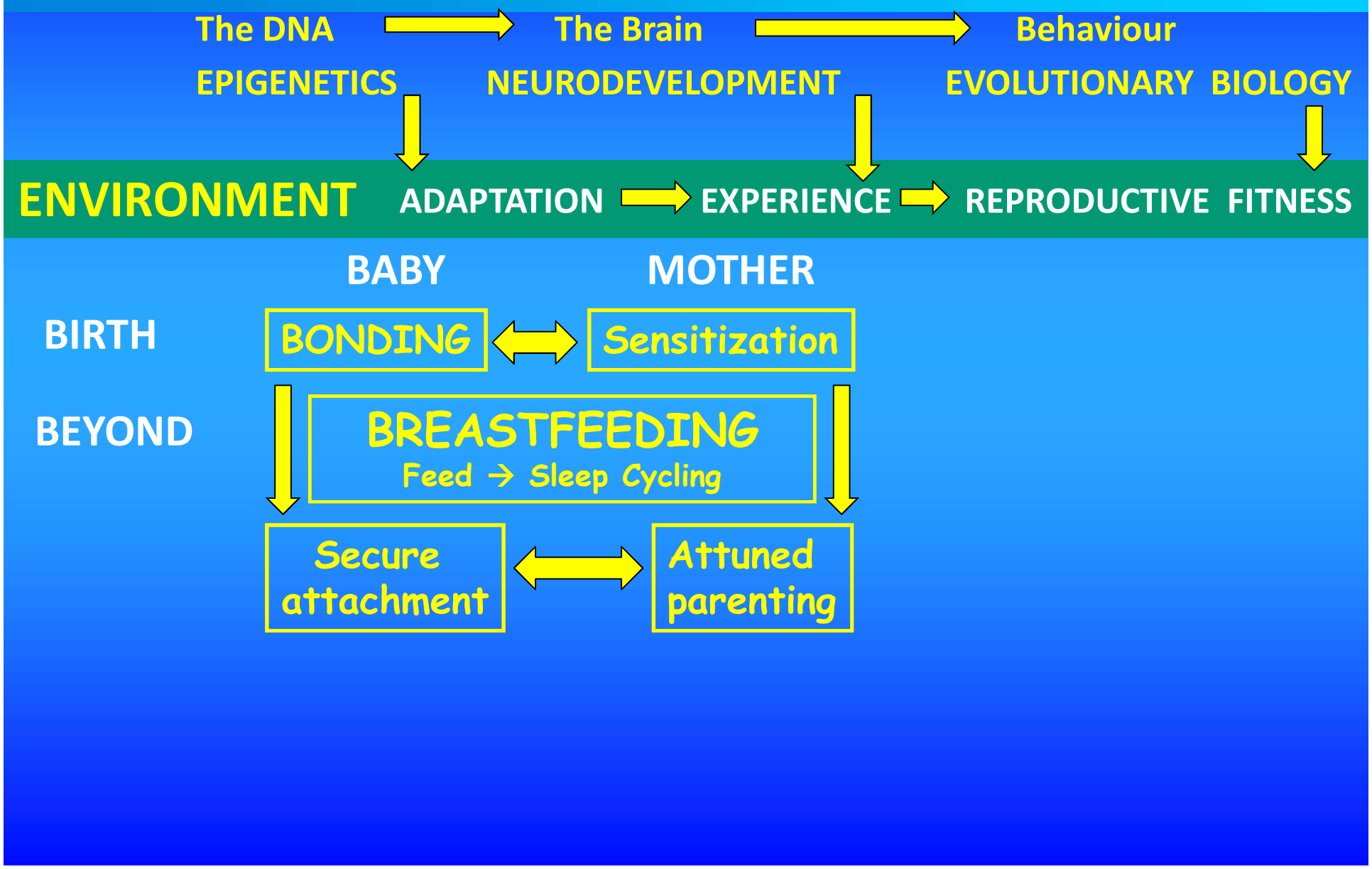
Dose of SCC first 24 hours correlates

NCATS (Nursing Child Assessment Teaching Scale)

Predicts cognitive outcome

SENSITIZATION

The Neuroscience of Birth & Breastfeeding



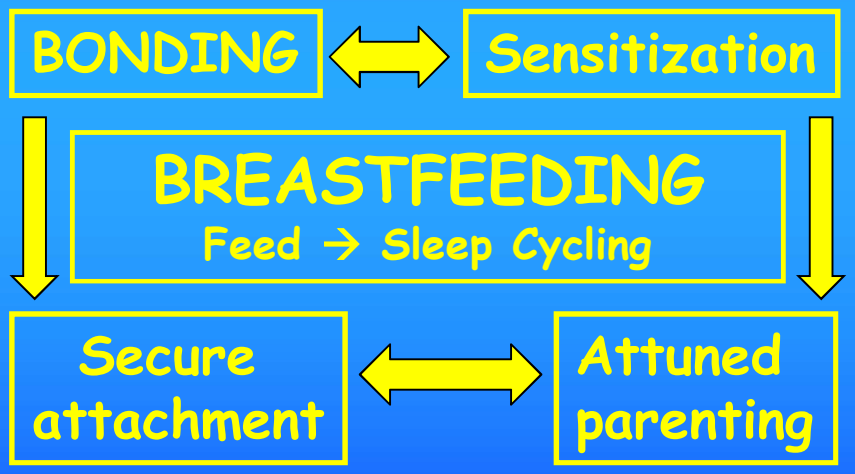
HOW EARLY SHOULD THE KANGAROO POSITION START?

ENVIRONMENT

SKIN-TO-SKIN CONTACT

BABY

BIRTH



Maternal sensitization

HOW EARLY SHOULD THE KANGAROO POSITION START?

ENVIRONMENT

SKIN-TO-SKIN CONTACT

BIRTH

A: AT BIRTH

Transition → regulation

Bonding → breastfeeding

Maternal sensitization

HOW EARLY SHOULD THE KANGAROO POSITION START?

ENVIRONMENT SKIN-TO-SKIN CONTACT

A: AT BIRTH

Immediate

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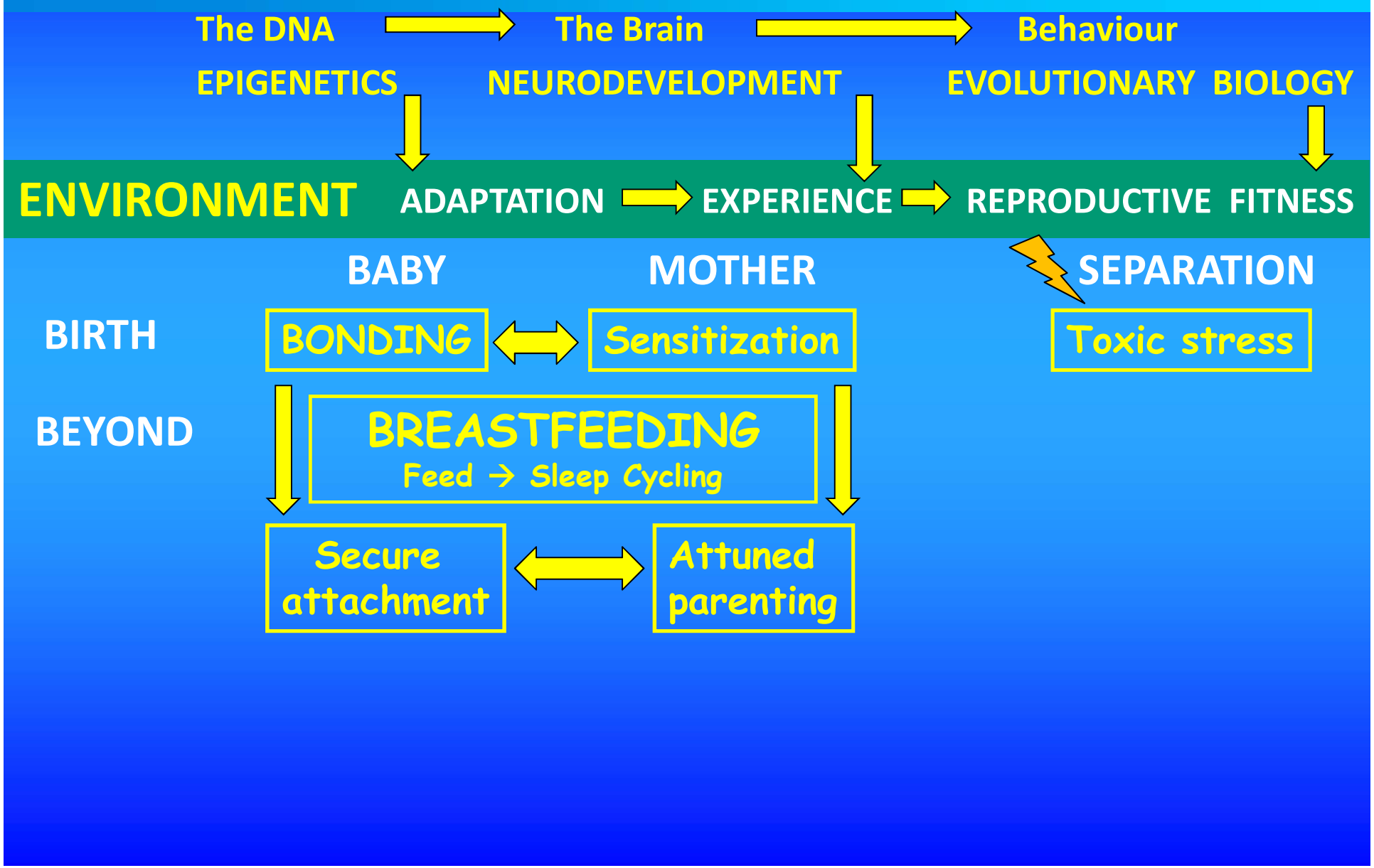
BABY MOTHER

BIRTH BONDING ⇔ Sensitization

Immediate

First 1000 seconds (1st hour) TRANSITION
First 1000 minutes (1st day) SENSITIZATION
First 1000 hours (6 weeks) BOND/ATTACH
→ First 1000 days ECD

The Neuroscience of Birth & Breastfeeding



Positive Stress

- **Moderate, short-lived stress responses, such as brief increases in heart rate or mild changes in stress hormone levels.**

- **An important and necessary aspect of healthy development that occurs in the context of stable and supportive relationships.**

Slide by: Jack P. Shonkoff, M.D.

Tolerable Stress
Toxic Stress

- **Strong and prolonged activation of the body's stress management systems in the absence of the buffering protection of adult support.**

Toxic Stress

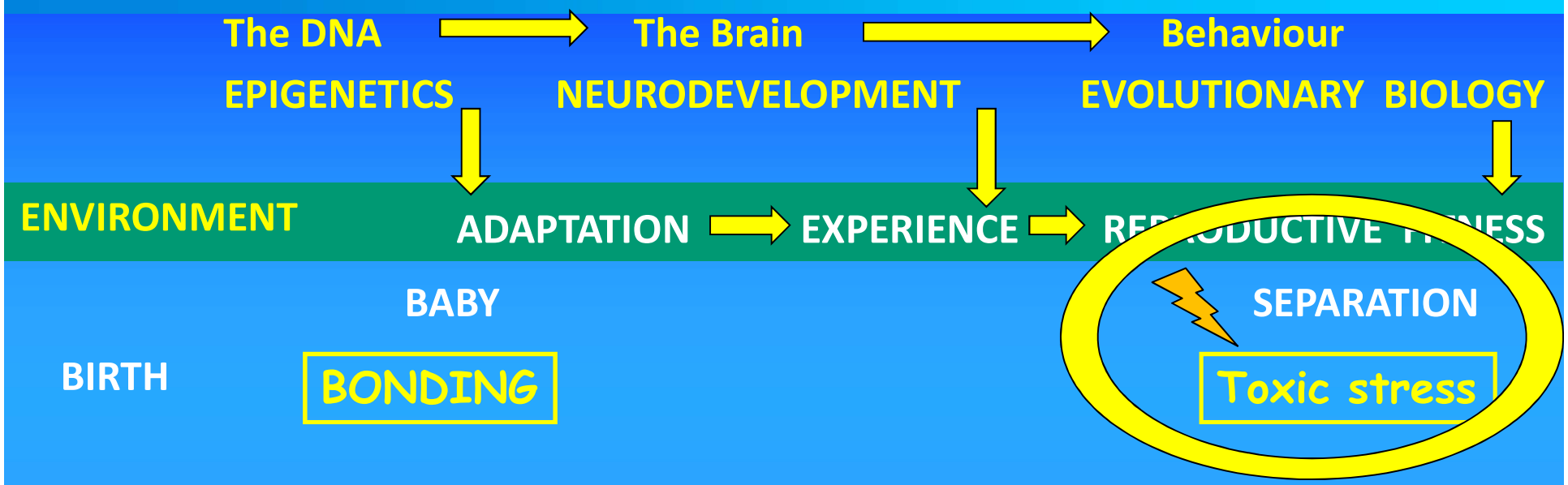
- Strong and prolonged activation of the body's stress management systems in the absence of the buffering protection of adult support.

- Disrupts brain architecture and leads to stress management systems that respond at relatively lower thresholds, thereby increasing the risk of stress-related physical and mental illness.

CORTISOL

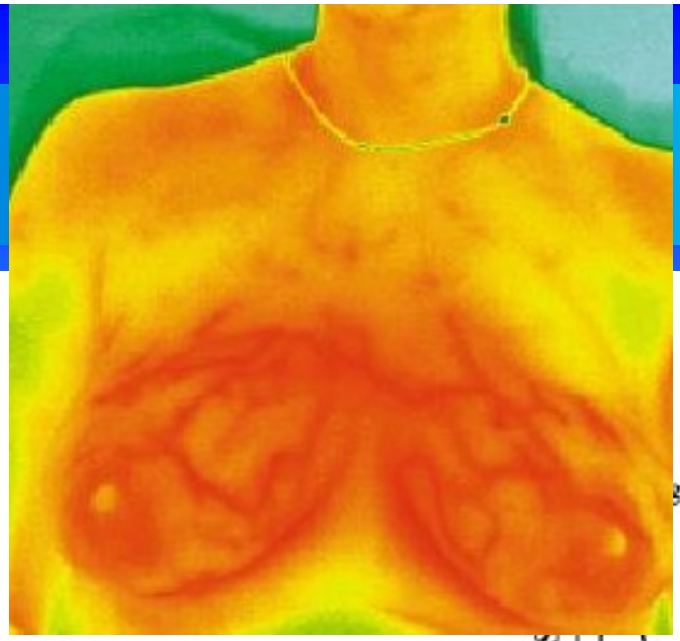
Slide by: Jack P. Shonkoff, M.D.

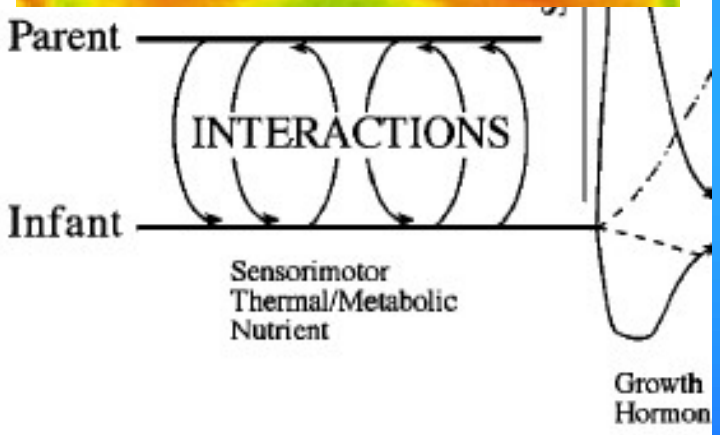
The Neuroscience of Birth & Breastfeeding



- **Disrupts brain architecture**

and leads to stress management systems that respond at relatively lower thresholds, thereby **increasing the risk** of stress-related physical and mental illness.





REGULATION L(

OXYTOCIN

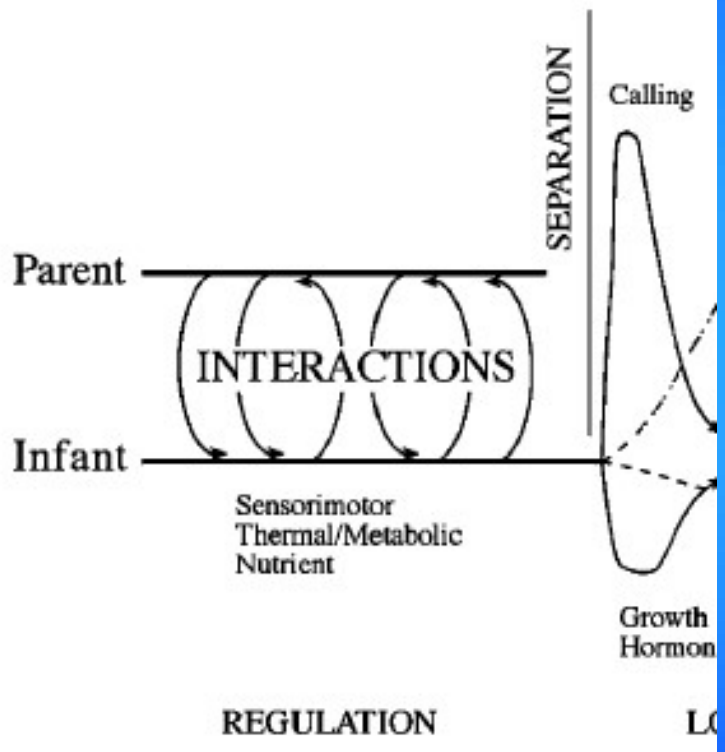
ntation of
he loss of
mother–infant relationship.

SEPARATION

Toxic stress

WHY IS EARLY MATERNAL SEPARATION STRESSFUL?

SEPARATION



OXYTOCIN

ntation of
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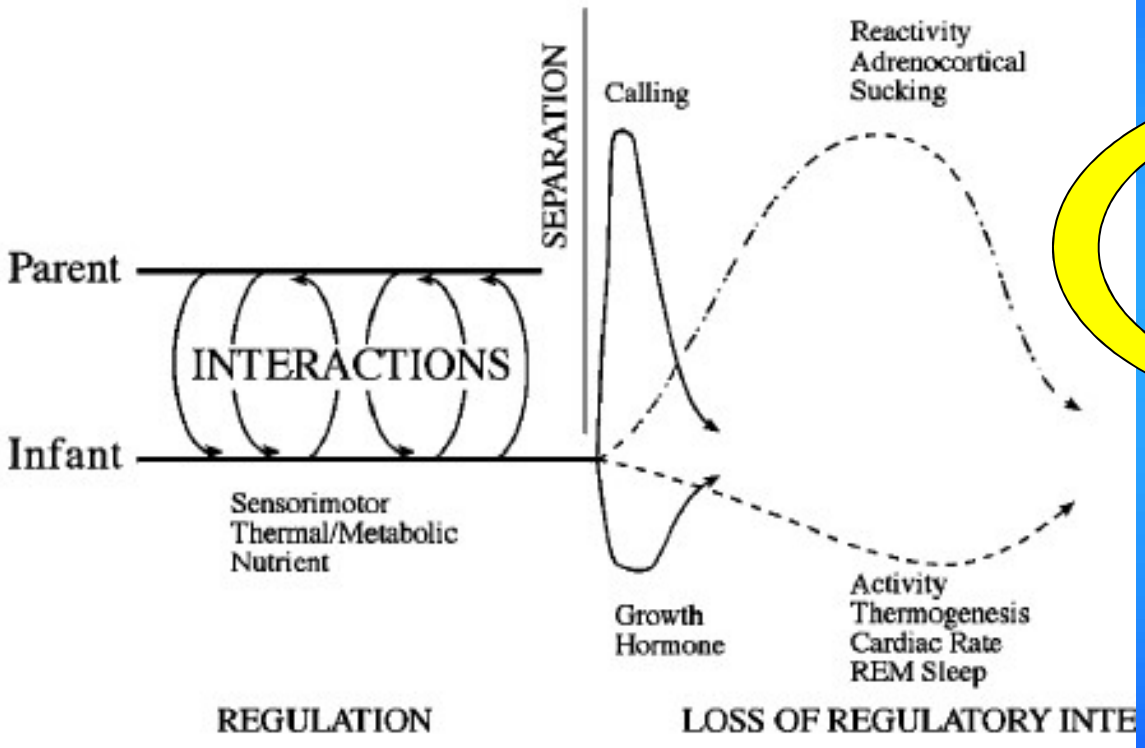
WHY IS EARLY MATERNAL SEPARATION STRESSFUL?

SEPARATION DYSREGULATES



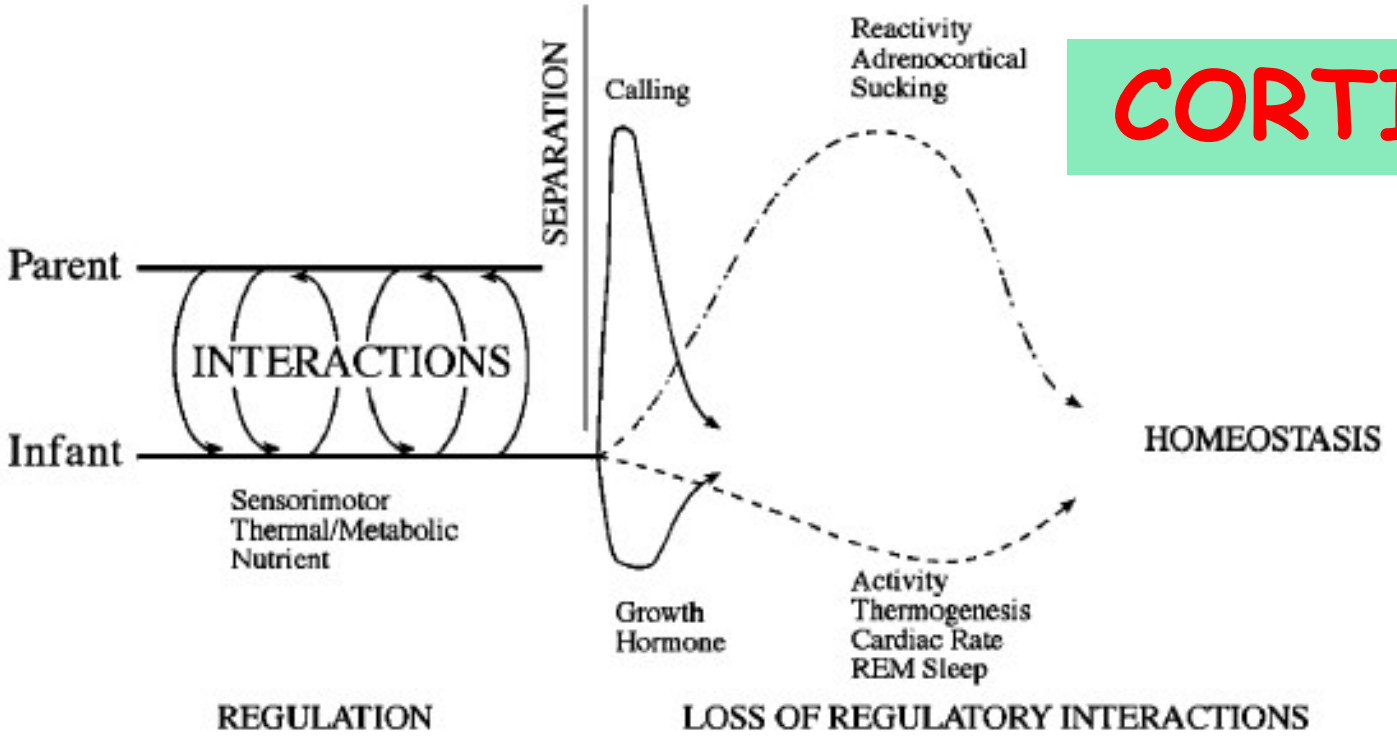
ntation of the dynamics of ear
he loss of regulatory interactio
mother–infant relationship.

OXYTOCIN

WHY IS EARLY MATERNAL SEPARATION STRESSFUL?

SEPARATION DYSREGULATES

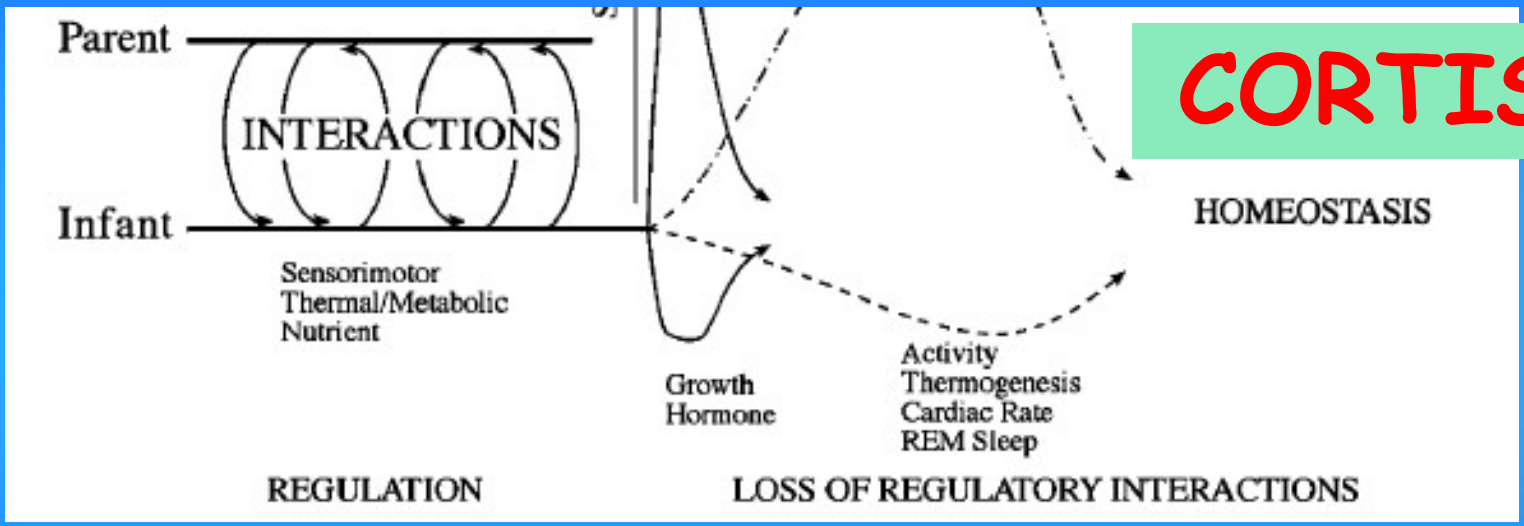
CORTISOL



OXYTOCIN

ntation of the dynamics of early-separation
he loss of regulatory interactions within the
mother–infant relationship.

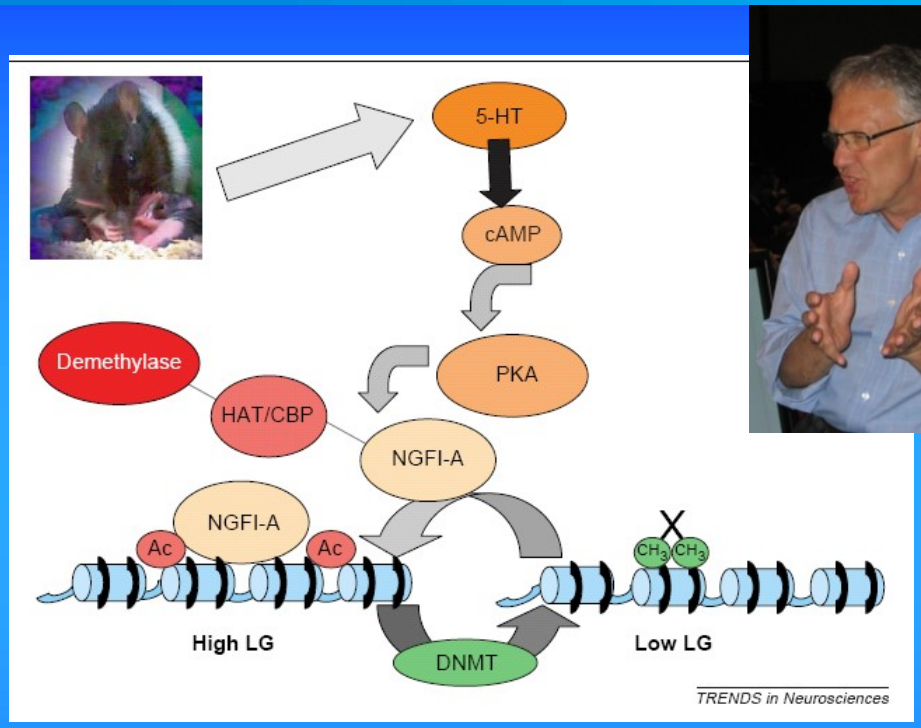
WHY IS EARLY MATERNAL SEPARATION STRESSFUL?

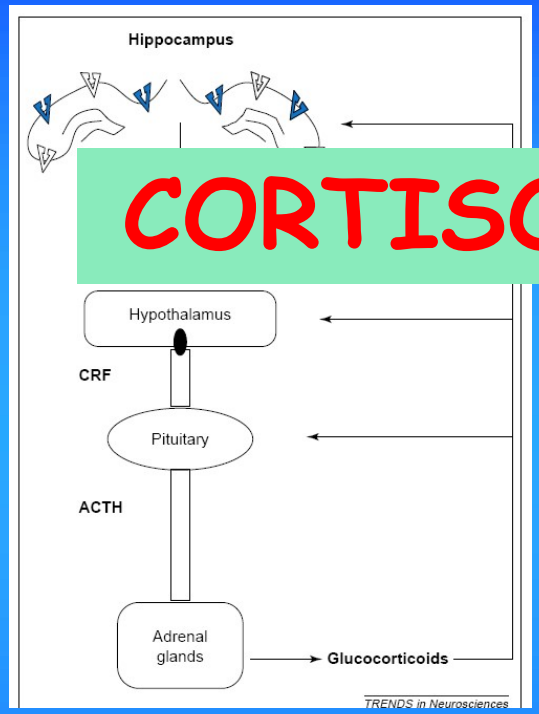


CORTISOL

components (e.g., nutrient, thermal/metabolic, or sensorimotor) of the infant's previous interaction with its mother and that the complex response to separation was due to the withdrawal of all these components at once.

MICHAEL MEANEY epigenetics

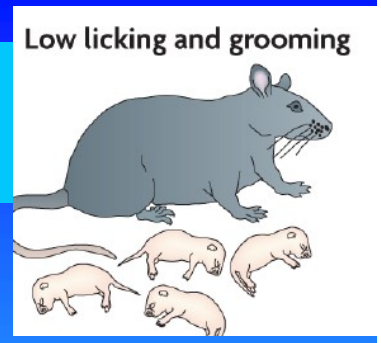




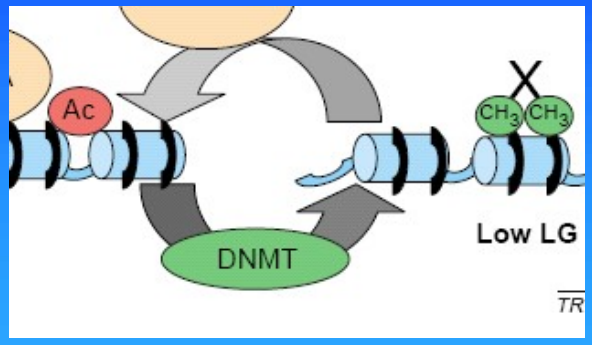
Unsafe environment activates HPA axis (autonomic nervous system, ANS).

MOTHER
HG - High Grooming

MOTHER
Low Grooming LG



HG BABY



LG BABY

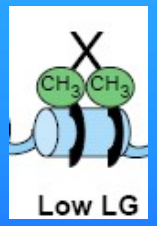
Healthy adult

UNHEALTHY adult

Makes MOTHER
HG – High Grooming

Makes MOTHER
Low Grooming - LG

HG BABY



HG BABY
LOW Grooming care

CORTISOL

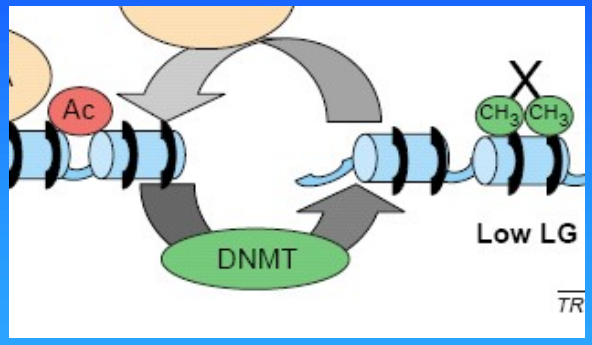
UNHEALTHY adult

Makes MOTHER
LOW Grooming LG

MOTHER
HG - High Grooming

MOTHER
Low Grooming LG

HG BABY



LG BABY

Healthy adult

UNHEALTHY adult

Makes MOTHER
HG – High Grooming

Makes MOTHER
Low Grooming - LG

Early stress alters gene expression, with health impact across lifespan.

The Neuroscience of Birth & Breastfeeding

The DNA → The Brain → Behaviour

EPIGENETICS — NEURODEVELOPMENT — EVOLUTIONARY BIOLOGY

ENVIRONMENT → ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS

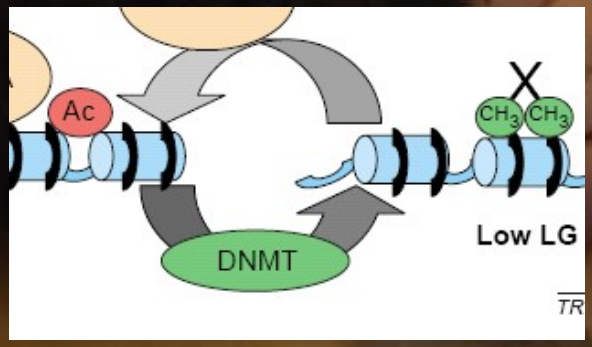
BABY

BIRTH

BONDING

SEPARATION

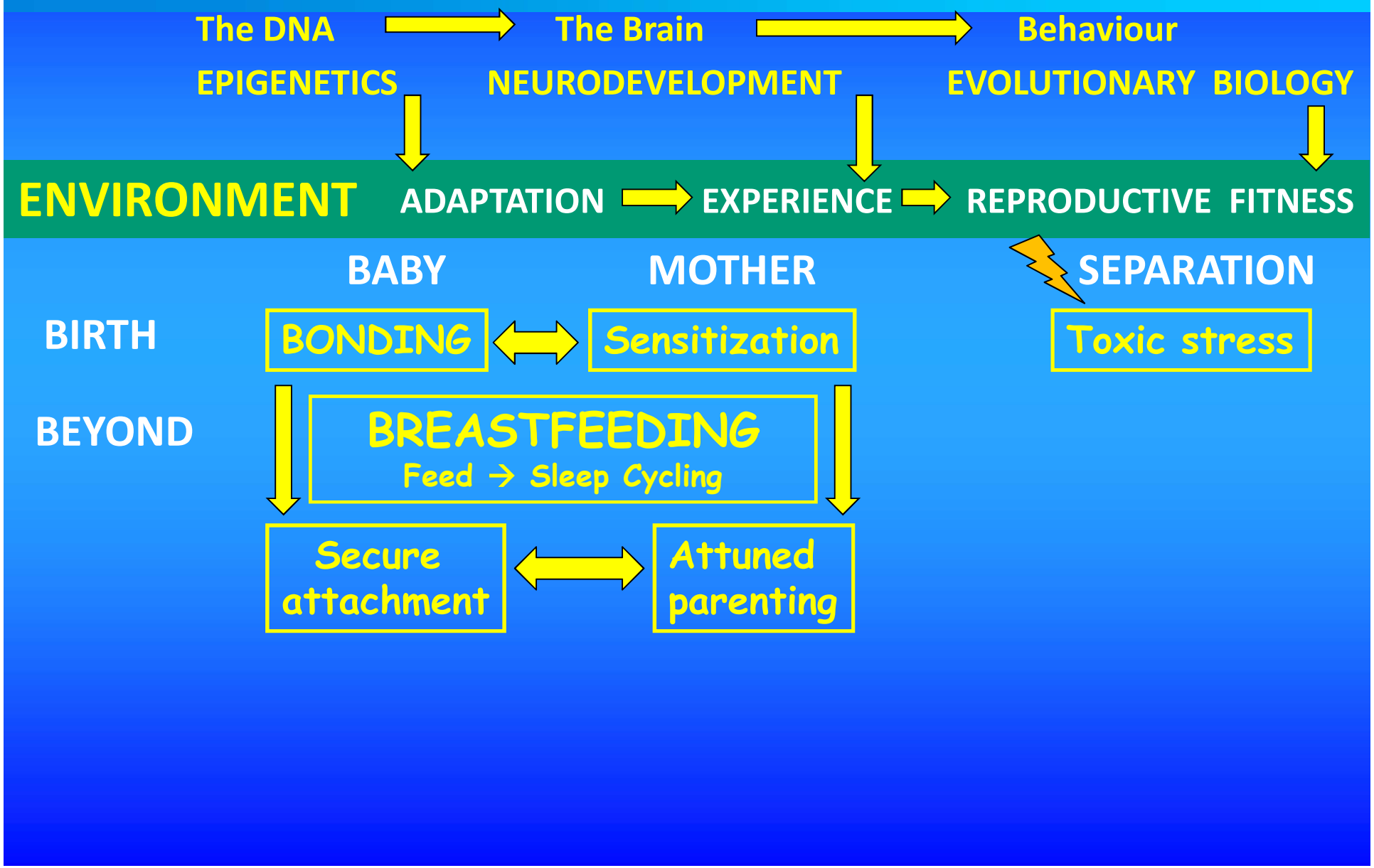
Toxic stress



OXYTOCIN

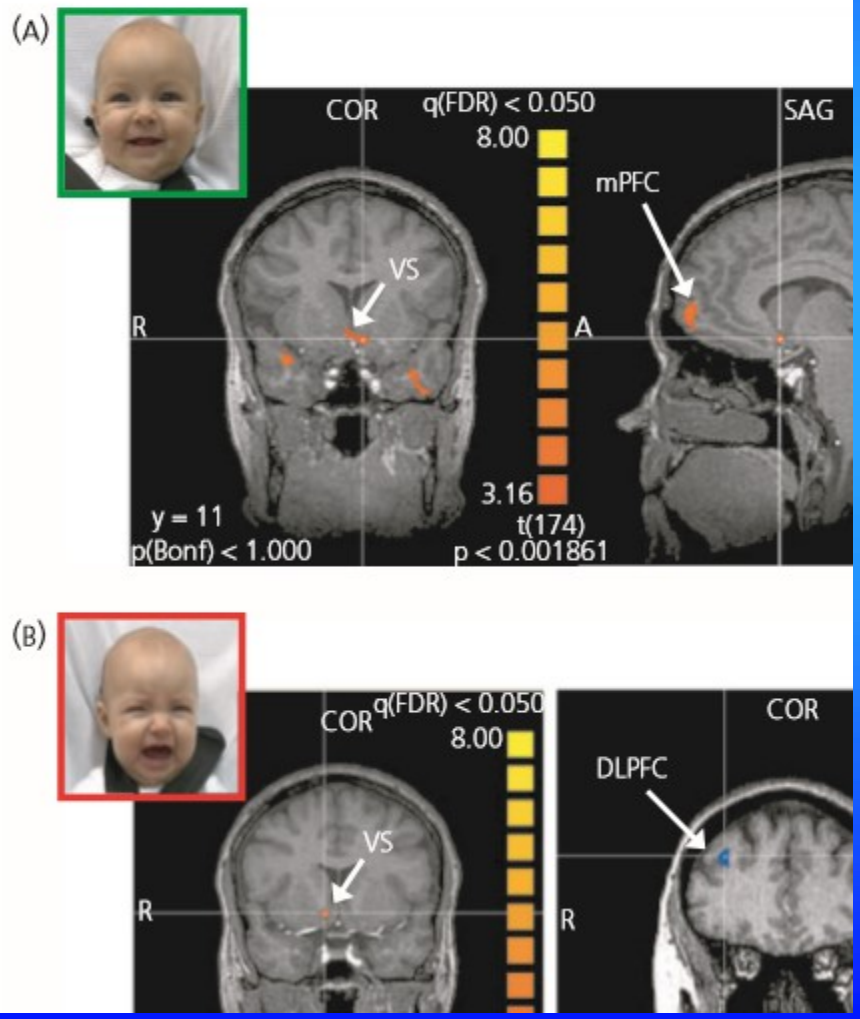
CORTISOL

The Neuroscience of Birth & Breastfeeding



How oxytocin and dopamine connect

From animal studies, we learn that oxytocinergic circuits are directly linked with the mesocorticolimbic dopamine pathway, with oxytocinergic neurones projecting from the hypothalamic PVN and MPOA to both the VTA and the VS (Fig. 3). The strength of these connections is associated with levels of maternal caregiving behav-



… infant cues - suckling, vocalisation and tactile stimulation - stimulate **OXYTOCIN** release in the hypothalamus, which may result in the activation of the dopaminergic reward pathway leading to behavioural reinforcement

REVIEW ARTICLE

Maternal Neglect: Oxytocin, Dopamine and the Neurobiology of Attachment

L. Strathearn*†‡§

key biological systems … that contribute to maternal caregiving behaviour … the oxytocinergic and dopaminergic systems.

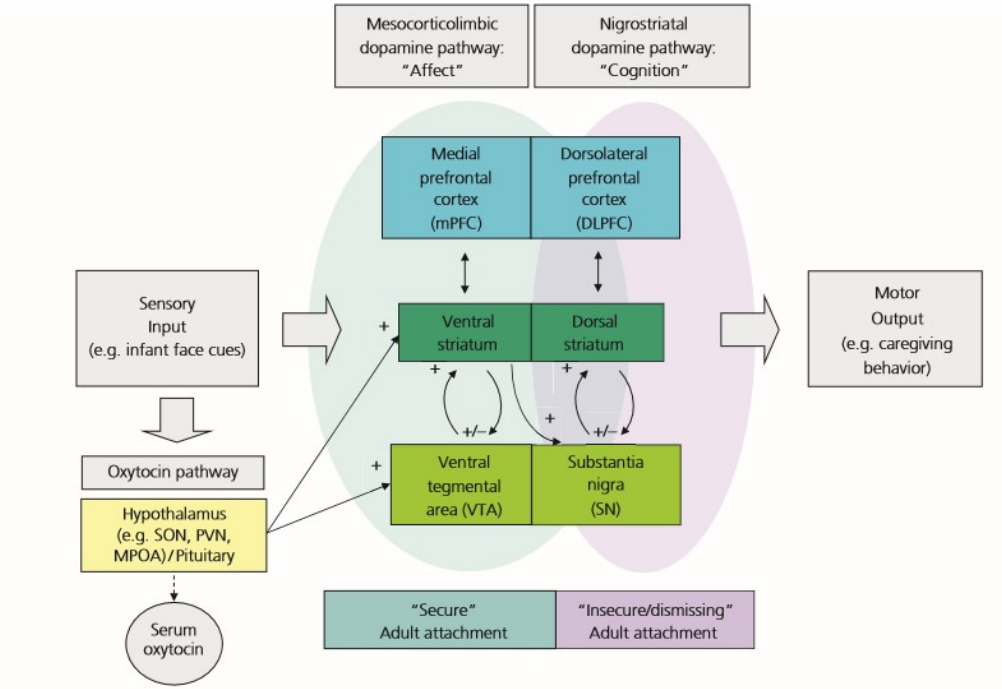
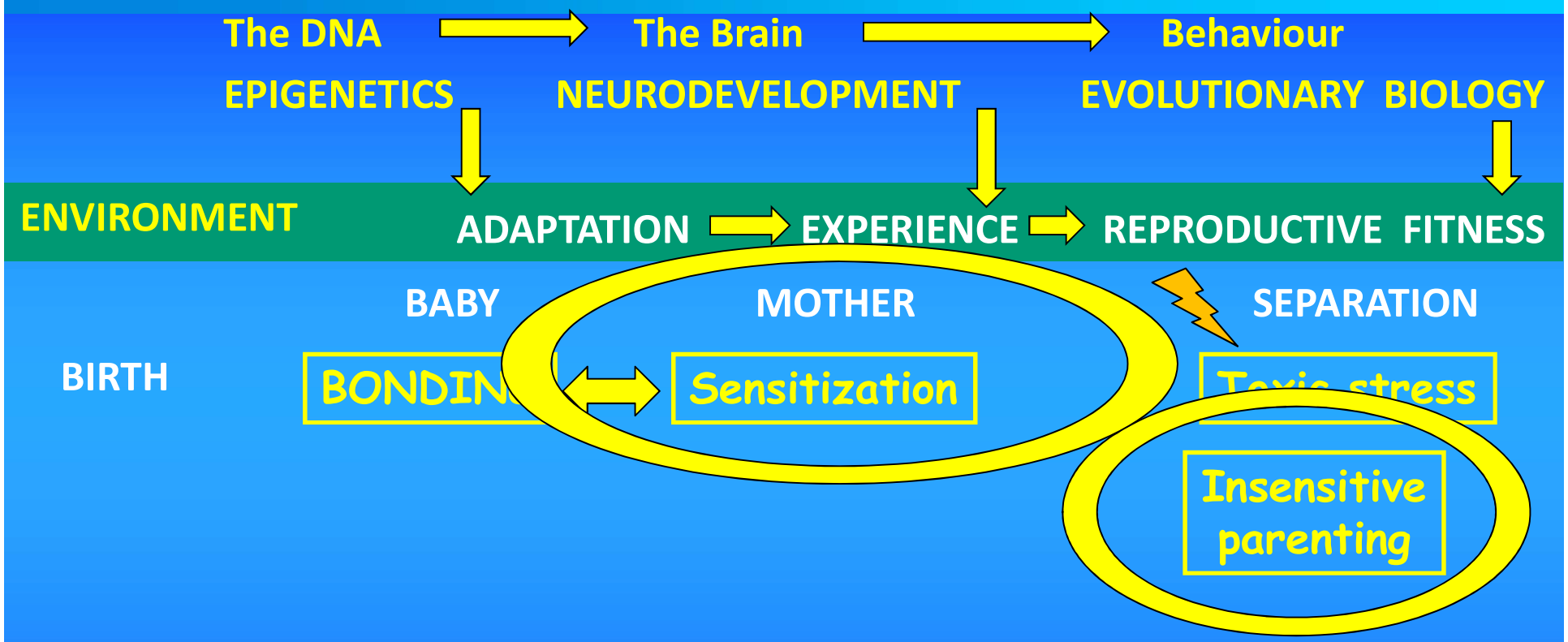


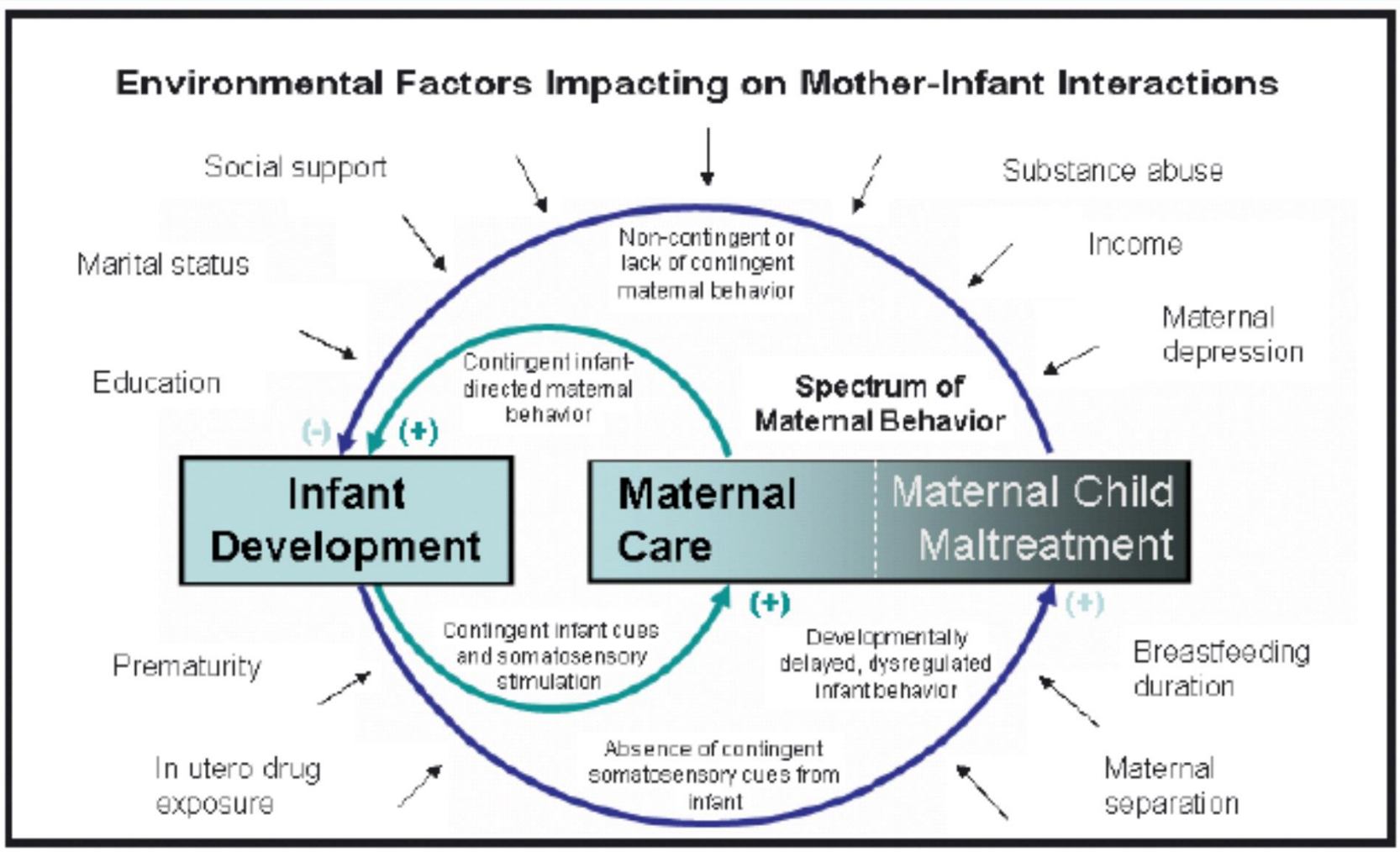
Fig. 3. Model of maternal brain responses to infant cues: proposed dopaminergic and oxytocinergic pathways relating to adult attachment patterns and insecure/dismissing). SON, supraoptic nucleus; PVN, paraventricular nucleus; MPOA, medial preoptic area.

… dopamine pathways contribute to the processing of infant-related sensory cues leading to a behavioural response. c

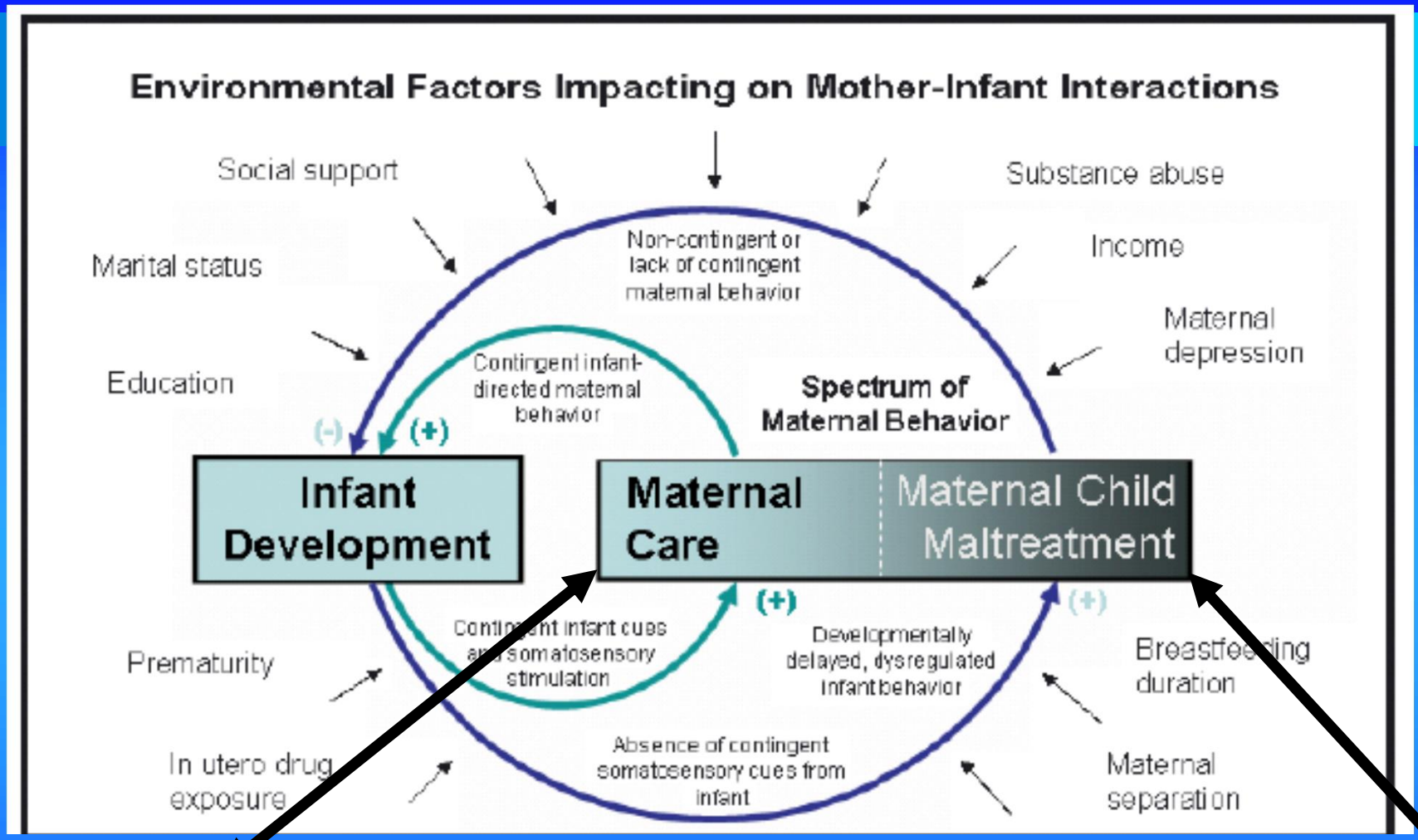
The Neuroscience of Birth & Breastfeeding



Specifying the Neurobiological Basis of Human Attachment: Brain, Hormones, and Behavior in Synchronous and Intrusive Mothers



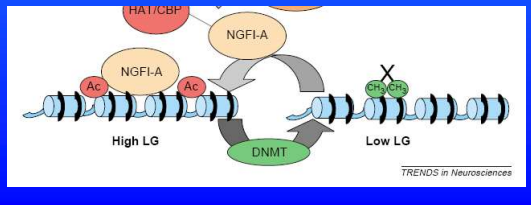
Early stress alters gene expression, with health impact across lifespan.



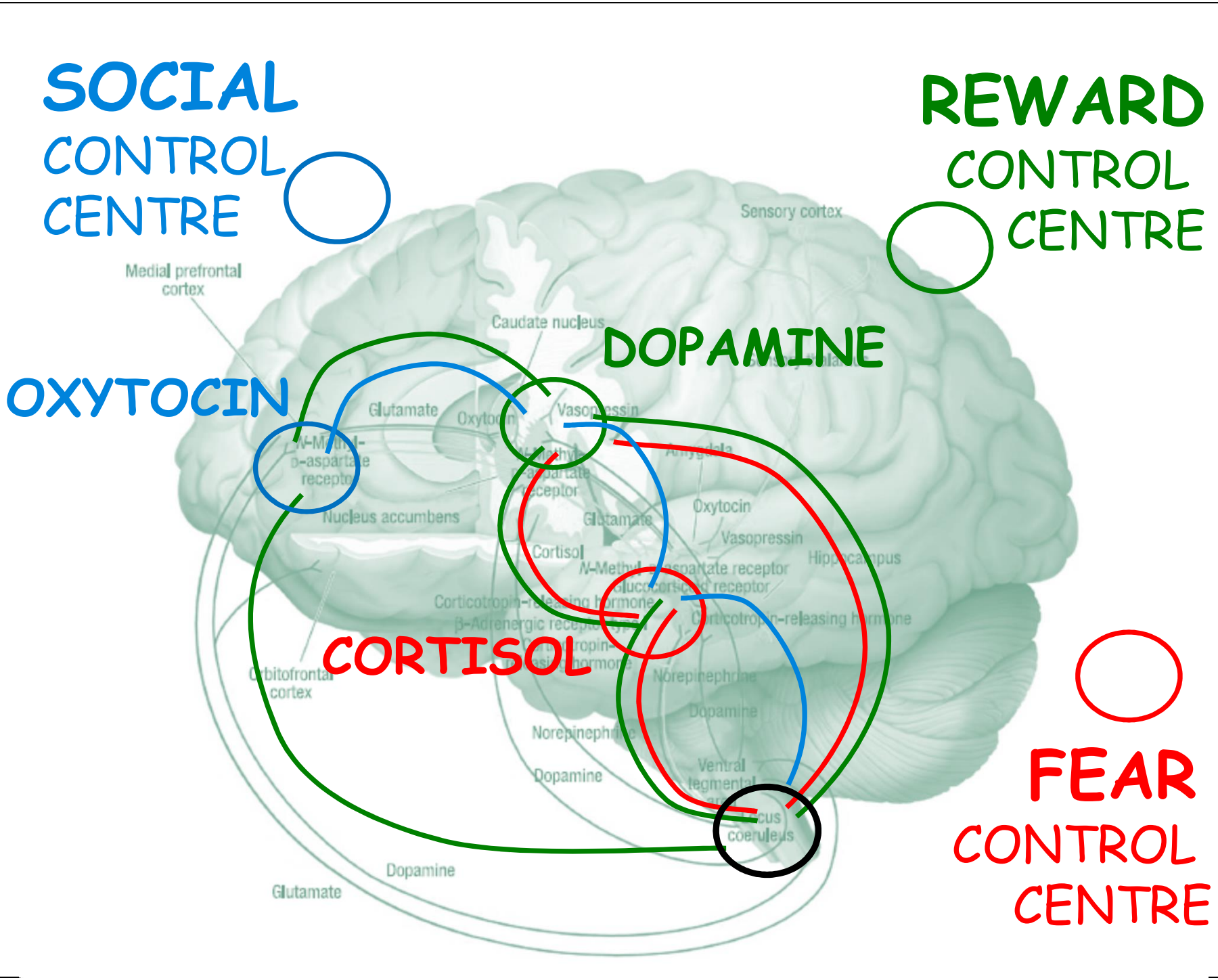
HEALTH

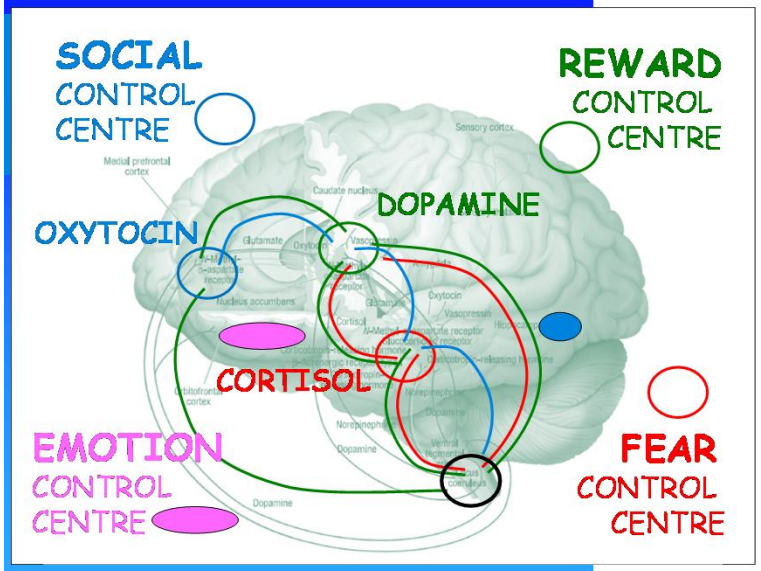
DISEASE

OXYTOCIN



CORTISOL


SOCIAL
CONTROL
CENTRE
REWARD
CONTROL
CENTRE
Medial prefrontal cortex
Caudate nucleus
Sensory cortex
DOPAMINE
OXYTOCIN
Glutamate
Oxytocin
Vasopressin
Nucleus accumbens
Amygdala
Oxytocin
Vasopressin
Cortisol
Hippocampus
Corticotropin-releasing hormone
CORTISOL
Orbitofrontal cortex
Norepinephrine
Dopamine
Norepinephrine
Dopamine
Ventral tegmental
coeruleus
Dopamine
Glutamate
FEAR
CONTROL
CENTRE



Dennis S. Charney, M.D.

Psychobiological Mechanisms of Resilience and Vulnerability:

Implications for Successful Adaptation to Extreme Stress

… there is considerable overlap in the brain structures associated with these neural mechanisms … functional interactions among the circuits.

HEALTH — DISEASE

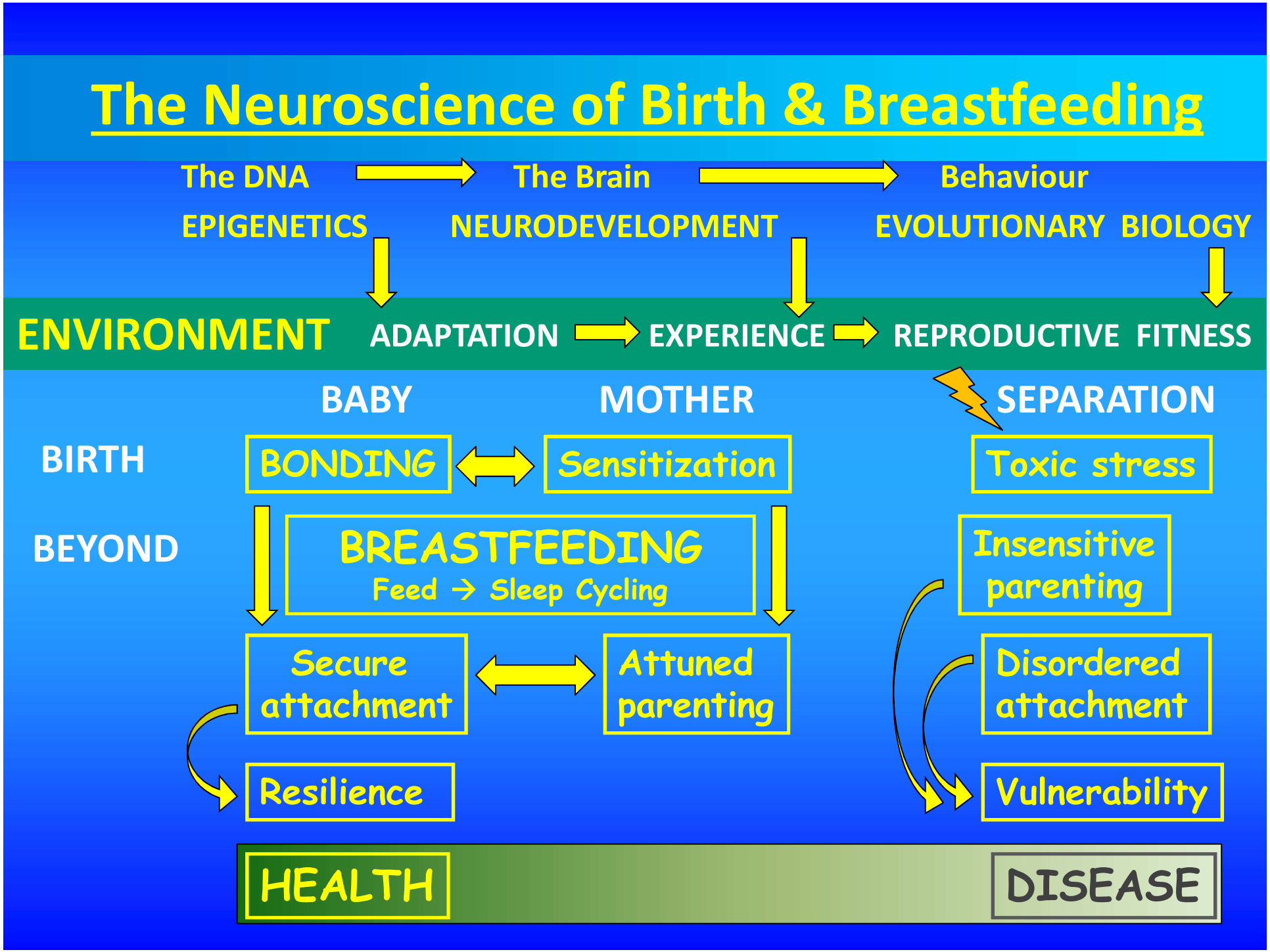
RESILIENCE — **VULNERABILITY**

WELL-BEING → SUSCEPTIBILITY → MORBIDITY → MORTALITY

RESILIENCE

(= STRESS RESISTANCE)

"capacity to maintain healthy emotional functioning in the aftermath of stressful experiences"


The Neuroscience of Birth & Breastfeeding
The DNA
EPIGENETICS
The Brain
NEURODEVELOPMENT
Behaviour
EVOLUTIONARY BIOLOGY
ENVIRONMENT
ADAPTATION
EXPERIENCE
REPRODUCTIVE FITNESS
BABY
MOTHER
SEPARATION
BIRTH
BONDING
Sensitization
Toxic stress
BEYOND
BREASTFEEDING
Feed → Sleep Cycling
Insensitive parenting
Secure attachment
Attuned parenting
Disordered attachment
Resilience
Vulnerability
HEALTH
DISEASE

The Neuroscience of Birth & Breastfeeding

Skin-to-skin contact is NORMAL BIOLOGY for all newborns

TOXIC STRESS = absence of the buffering protection of adult support.

DISEASE

SEPARATION IS A STRESSOR FOR FULL TERM NEONATES

preterms have less resilience:

SEPARATION IS A SEVERE STRESSOR FOR PRETERMS

TOXIC STRESS = absence of the buffering protection of adult support.

Skin-to-skin contact IS MORE essential for premature newborns!

Skin-to-skin contact IS MORE essential for premature newborns!

Our NORMAL biology

SUCKLING precedes breastfeeding

Skin-to-skin "causes" breastfeeding


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


XSP02
100
158
TRENDS
SETUP
LIGHT

SUCKLING


The ABILITY TO SUCKLE
IS WIRED IN EVERY BABY
even if premature !!

SUCKLING

PROTECT SUCKLING

- WHILE FEEDING -

UNTIL BREASTFEEDING STRONG.

Kangaroo nutrition

HOW EARLY SHOULD THE KANGAROO POSITION START?

A: AT BIRTH

Immediate

The Neuroscience of Birth & Breastfeeding

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BABY MOTHER

BIRTH BONDING ⇔ Sensitization

Immediate

First 1000 seconds (1st hour) TRANSITION
First 1000 minutes (1st day) SENSITIZATION
First 1000 hours (6 weeks) BOND/ATTACH
→ First 1000 days ECD

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IPISTOSS
Immediate
Parent-Infant
Skin-TO-Skin

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Underlying scientific rationale

IPISTOSS

Immediate Parent-Infant Skin-TO-Skin

PRETERM BIRTH

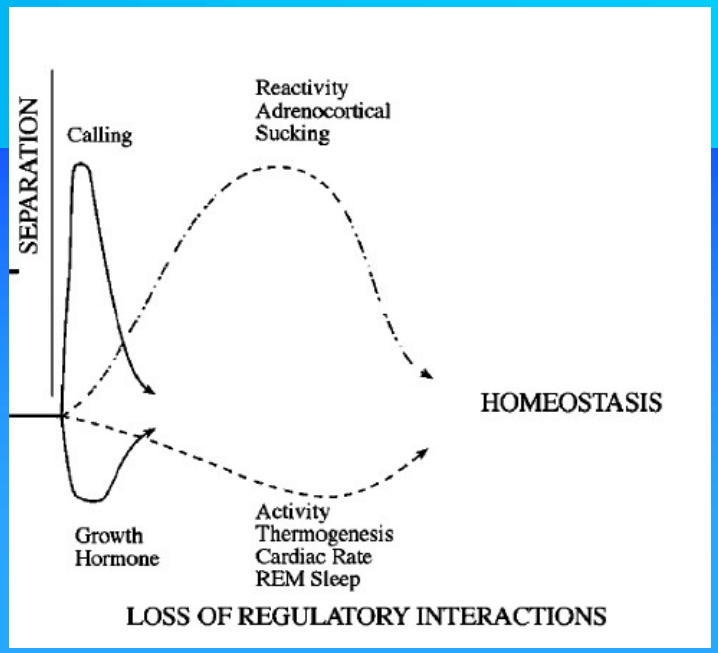
TRANSITION

SEPARATION

FAILS

CASCADE OF DYSREGULATION

INSTABILITY



Hypoxia

Hypothermia

Bradycardia

Infection

Hypoglycemia

PRETERM BIRTH

TRANSITION

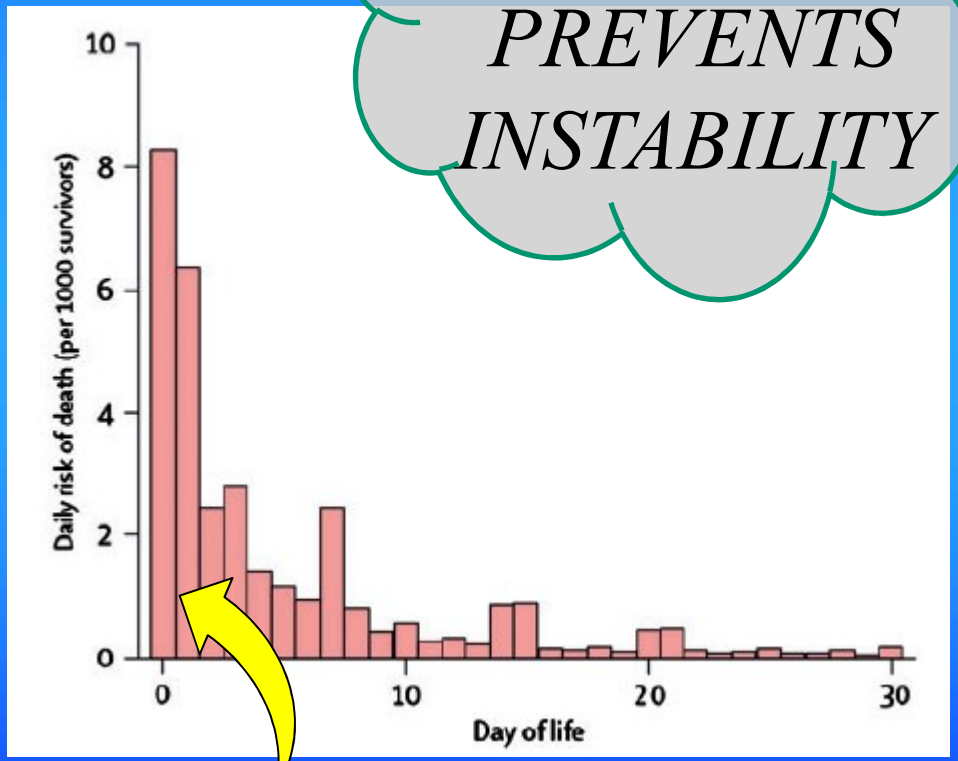
SEPARATION

FAILS

INSTABILITY

MORTALITY

Skin-to-skin
STABILIZES
&
PREVENTS
INSTABILITY



Excluded from KMC studies

LIC MIC

Tanzania Malawi Ghana Nigeria India

IKMC

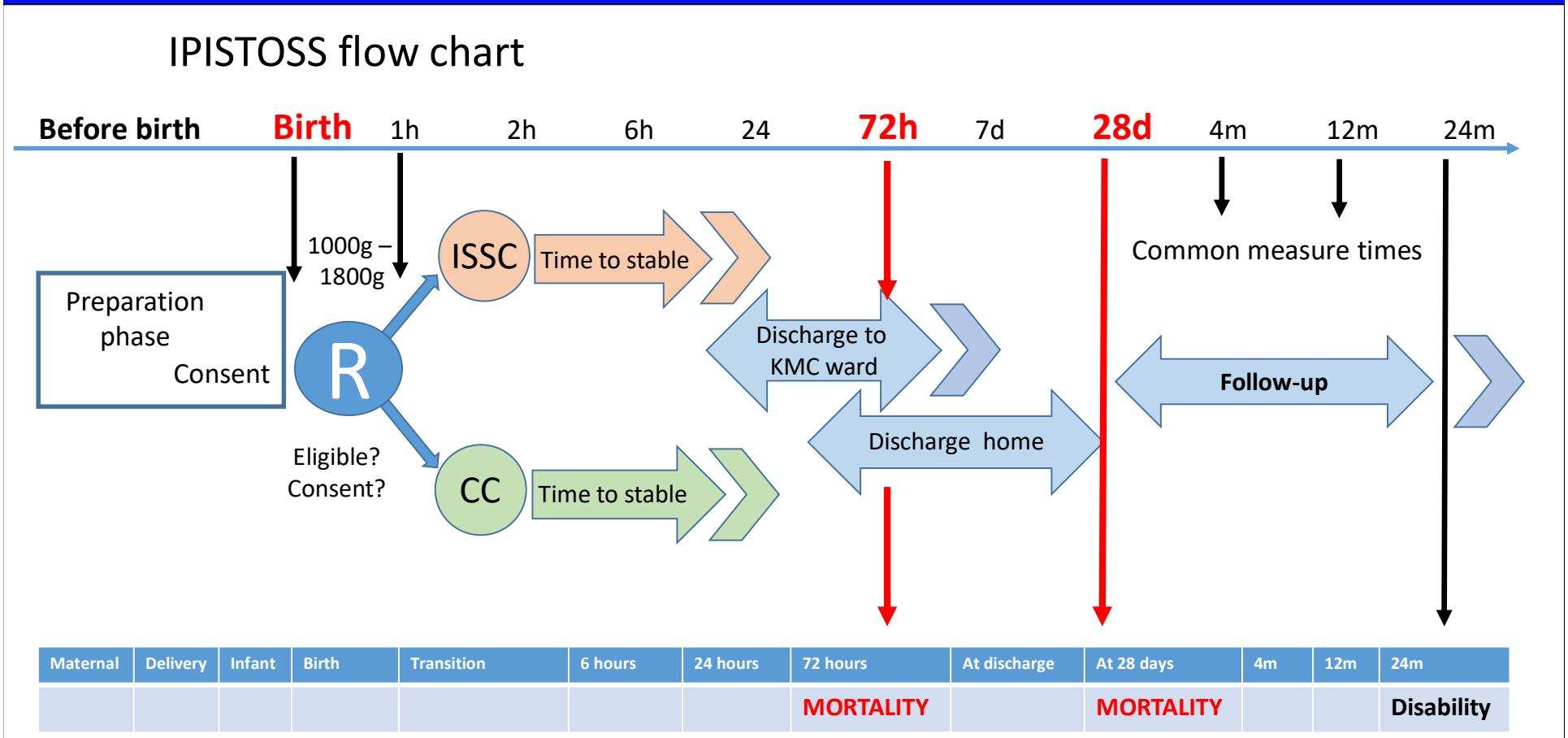
(Immediate – till stable)

~ 4200 babies

Mortality reduction ⟷

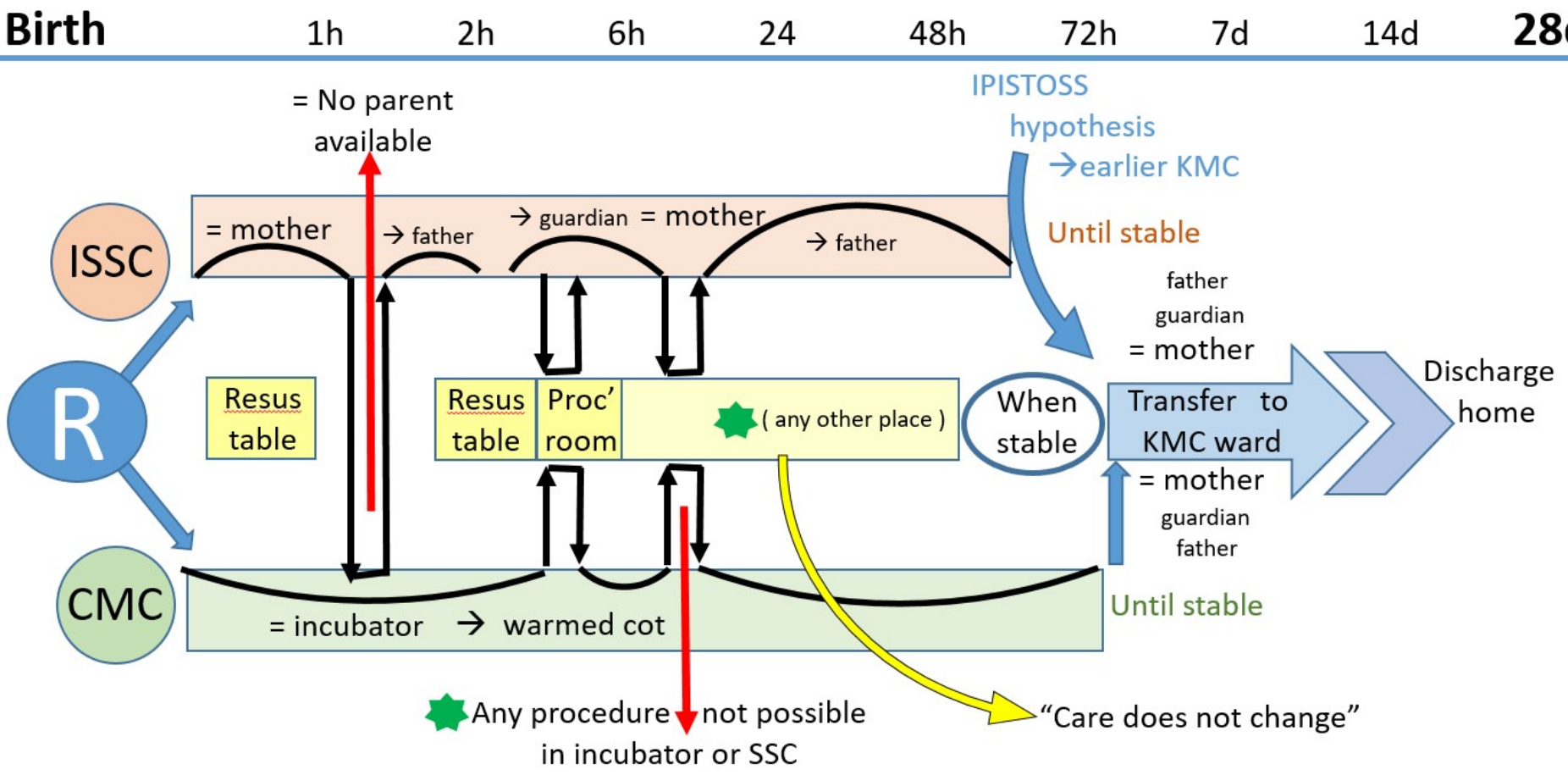
WHO

Bill & Melinda Gates Foundation



Immediate Parent Infant Skin-To-Skin Study (IPISTOSS) – A Multicenter Randomized Controlled Trial Comparing Skin-to-Skin Contact Initiated Within First 60 Minutes of Life and Continued Until Stabilization with Separation (Conventional Care) in Neonates with Birth Weight of 1000-1800g.

IPISTOSS patient chart – sample for 1800g infant



LIC MIC

Tanzania Malawi Ghana Nigeria India

IKMC

(Immediate – till stable)

~ 4200 babies

Mortality reduction ⟷

WHO

Bill & Melinda Gates Foundation

LIC MIC HIC

Tanzania Malawi Ghana Nigeria India Vietnam & RSA Norway Sweden

IKMC

(Immediate – till stable)

~ 4200 babies

IPISTOSS

(Immediate – till stable)

~ 1200 babies

Mortality reduction ⟷ **Mechanisms research**

WHO

Bill & Melinda Gates Foundation

Karolinska, Sweden

Laerdal, others

BabyBjorn …


165
90
20

The Neuroscience of Birth & Breastfeeding

The DNA → The Brain → Behaviour

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ENVIRONMENT ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS

ENVIRONMENT WHAT IS THE EFFECT OF MATERNAL ABSENCE ON …

IPISTOSS

Immediate

Parent-Infant

Skin-TO-Skin

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ENVIRONMENT WHAT IS THE EFFECT OF MATERNAL ABSENCE ON …

TRANSITION

NEUROENDOCRINE BEHAVIOURS

GENETIC VARIANTS

RESILIENCE

BONDING → ATTACHMENT

GENE X ENVIRONMENT

STRESS RESPONES

MATERNAL NEUROPLASTICITY

EPIGENETICS DOHAD

"STABILITY"

SLEEP PHYSIOLOGY

(MAL) ADAPTATION

EEG MRI HRV

MICROBIOTA GUT FUNCTION

LONG TERM FOLLOW-UP

IMMUNITY

HOSPITAL ACQUIRED INFECTION

MORTALITY

HOW EARLY SHOULD THE KANGAROO POSITION START?

ENVIRONMENT ADAPTATION → EXPERIENCE → REPRODUCTIVE FITNESS

ENVIRONMENT WHAT IS THE EFFECT OF MATERNAL ABSENCE ON …

IPISTOSS
Immediate
Parent-Infant
Skin-TO-Skin

HOW EARLY SHOULD THE KANGAROO POSITION START?

ENVIRONMENT SKIN-TO-SKIN CONTACT

IPISTOSS
Immediate
Parent-Infant
Skin-TO-Skin