Lasting impacts of KMC on the development of the premature/Low Birth Weight infant and its family 20 years later.

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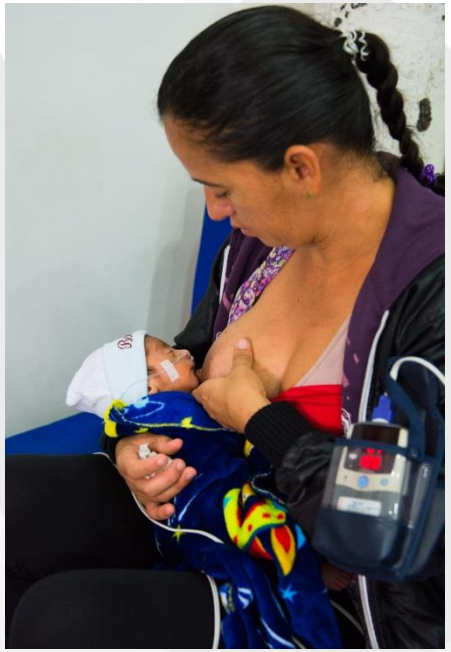
Scientific Coordinator, KMC Centers of Excellence, Bogota, Senior Researcher and Director, Kangaroo Foundation, Bogota, Colombia.

In 1978, Dr. Edgar Rey initiated KMC at the *"Instituto Materno Infantil"* in Bogotá, Colombia

What is the KMC method?

3 components: Kangaroo position, Kangaroo nutrition, and early discharge in KP with strict follow up

1. Kangaroo position initiated as soon as possible and for as long as possible




Programa Madre
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Kangaroo Nutrition: based on breastmilk of the mother








The challenge: successful breastfeeding of the premature infant

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3. Early discharge at home with Ambulatory follow up




Nalgonda
Chenai
Mumbai
New Dehli
Lucknow
etc…….

Or early discharge in a KMC ward with Ambulatory follow up



In 1989 the Kangaroo Foundation choose the scientific research to convince our colleagues that KMC was not the " poor man alternative" but the best choice for the care of all the premature or low birth weight infants in the world.

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Kangaroo Mother Care versus traditional care for LBWI 1993-1996 , Bogotá, Colombia

- Our group conducted a randomized clinical trial (RCT) of the original KMC intervention and "traditional" inpatient care.
- The participants were infants who weighed ≤ 2,000 g at birth, survived the transition to extra-uterine life, and were eligible for neonatal minimal care.
- They were randomly assigned to KMC or to the control group according to birth weight (≤ 1,200, 1,201–1,500, 1,501–1,800, and 1,801–2,000 g).

The RCT showed that morbidity, mortality, growth, development, and other selected health-related outcomes were at least as good or better that those obtained with usual care when infants reached term and at 1 year of corrected age. *(Pediatrics 1997, 1998, 2001 Acta Paediatrica 2009, IBAD 2013)*

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18 years later

1. The documented 1-year benefits persist up to 20 years?
2. Does the KMC intervention has a long-term protective effect against cognitive, social, and academic difficulties?

Grand Challenges Canada™
Grands Défis Canada™

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Randomized open controlled trial on Kangaroo Mother Care versus traditional Care for low birth weight infants. Patient-centered outcomes at the age of 20 years. 2014 2017

Grand Challenges Canada™
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2012-2020 Long term impact of KMC

- Audiometric evaluation
- Optometric evaluation
- Pediatric evaluation
- Neuro-Psychological evaluation IQ, TAP CVLT VMI IPPA CES Kidcreen NHPT ABCL Conners
- Magnetic Resonance Imaging, fRMI, DTI
- Transcraneal Magnetic Stimulation
- Best Friend Interview (ABCL)
- Home Visit Interview and Home test
- Class Play Test
- Socioeconomic and education survey: Preschool and school history, School achievement, Labour force participation status and wages
- Life Habits

RESULTS

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PEDIATRICS

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

January 2017, VOLUME 139 / ISSUE 1

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Twenty-year Follow-up of Kangaroo Mother Care Versus Traditional Care

Nathalie Charpak, Rejean Tessier, Juan G. Ruiz, Jose Tiberio Hernandez, Felipe Uriza, Julieta Villegas, Line Nadeau, Catherine Mercier, Francoise Maheu, Jorge Marin, Darwin Cortes, Juan Miguel Gallego, Dario Maldonado

Pediatrics Jan 2017, 139 (1) e20162063; **DOI:** 10.1542/peds.2016-2063

PDF


DAILY TRUST

HEALTH 43

Kangaroo mother care helps premature babies thrive 20 years later

The long-term effects of the kangaroo mother care intervention on cognitive functioning: results from a longitudinal study. **Developmental neuropsychology. 2018 Jan 2;43(1):82-91.**

“袋鼠育儿法”有助于提升早产儿的健康和智力 "Kangaroo Parenting Act" to help improve the health and intelligence of premature children

Childhood Interventions and Parental Investments: The Long-run Effect of the Kangaroo Mother Care Program (KMC) on Cognitive and Socioemotional Skills. **LACEA-LAMES2019**

Long-term attention deficits combined with subcortical and cortical structural central nervous system alterations in young adults born small for gestational age. **Early Human Development, 110, 44-49 (2017).**


Prensa Libre, Guatemala

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Los beneficios del método canguro

The long-term effects of the kangaroo mother care intervention on cognitive functioning: results from a longitudinal study. **Developmental neuropsychology. 2018 Jan 2;43(1):82-91.**

Reuters, UK

Spanish: *Método "mamá canguro" favorece la salud de los niños a largo plazo*

https://es-us.noticias.yahoo.com/m%C3%A9todo-mam%C3%A1-canguro-favorece-la-salud-los-ni%C3%B1os-140001673.html

Can Tho Online, Viet Nam

Phương pháp "da kề da" có lợi cho trẻ đến khi trưởng thành

http://www.baocantho.com.vn/?mod=detnews&catid=74&id=187620

Neuf Mois, France

En quoi le peau à peau avec un bébé né prématuré lui est favorable 20 ans plus tard ?

http://www.neufmois.fr/au-fil-de-lactu/quoi-peau-a-peau-bebe-ne-premature-lui-favorable-20-ans-plus-tard

The Post Internazionale, Italy

La Canguro Terapia Migliora La Salute e L'intelligenza Dei Bambini Prematuri

http://www.tpi.it/mondo/colombia/canguro-terapia-migliora-salute-intelligenza-bambini-prematuri


Känguru-Methode mit viel Mehrwert

A Multi-facetted Visual Analytics Tool for Exploratory Analysis of Human Brain and Function Datasets. **Front Neuroinform. 2016 Aug 23; 10:36.**

Primary Finding

Cumulative Mortality at 20 years

KMC (N/Total)	Control (N/Total)	OR (95% CI)
8/229 (3.5%)	16/204 (7.7%)	0.42 (0.18 -1.02)

- After adjusting for weight and gestational age at birth:

  Protective effect of KMC OR 0.42 (0.16-0.94) *P=0.04*

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Main Findings (I)

Repeated measures of developmental and environmental outcomes at 6 months, 1 and 20 years according to neurological status at 6 months in the re-enrolled sample (≤ 1800 g)

Measure	KMC		Controls		*P*		
	Normal	**Transient or abnormal**	Normal	**Transient or abnormal**	KMC vs controls	Neurological status	Interaction between neurological status and groups
IQ at 6 months, Mean (SD)	98.1 (10.0)	**90.0 (13.4)**	99.5 (9.2)	**84.5 (12.6)**	0.23	0.00	**0.03**
IQ at 12 months, Mean (SD)	103.4 (6.6)	**99.4 (8.8)**	103.0 (6.7)	**94.6 (10.2)**			
IQ at 20 years, Mean (SD)	87.2 (13.1)	**90.2 (14.9)**	89.9 (14.9)	**87.0 (12.7)**			
HOME at 12 months, Mean (SD)	39.3 (6.8)	**39.9 (5.5)**	39.7 (7.5)	**35.5 (8.0)**	0.11	0.12	**0.02**
HOME at 20 years, Mean (SD)	39.5 (7.3)	**40.5 (6.0)**	40.7 (6.6)	**36.6 (5.4)**			

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Outcomes of the intervention observed at 12 months of corrected age on IQ at 20 years

Outcome at 1 year	IQ at 20 years		P
	IQ < 90	IQ ≥ 90	
Factorial score* of weight during first year of corrected age (mean (SD))	– 0.16 (0.96)	0.01 (0.89)	**0.01**
Factorial score* of height increase during first year of corrected age (mean (SD))	– 0.24 (0.95)	0.07 (0.97)	**0.01**
Factorial score* of head circumference during first year of corrected age (mean (SD))	– 0.12 (0.95)	0.15 (0.98)	**0.03**
Head circumference at 1 year of corrected age per 50th percentile of expected head circumference for age and gender x 100 (mean (SD))	97 (3.13)	98 (2.72)	**0.01**
HOME test at 1 year of corrected age (mean (SD))			
All five subscales	37.5 (6.24)	40.4 (5.32)	**0.00**
Family cognitive stimulation subscale	4.4 (2.34)	5.6 (2.46)	**0.00**
Structured environment subscale	5.5 (1.49)	5.8 (1.26)	**0.02**

* Factorial score of weight, height and head circumference at 40 weeks, 3, 6, 9 and 12 months of CA.

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Main Findings (II)Paternal Support

- We constructed a variable to evaluate paternal support that includes all aspects of the participation of the father in the care of the infant during the first year of follow-up.
- This variable had a positive impact on the home environment at 1 year of CA.
- The distribution of paternal support in the re-enrolled sample was the same in the two groups:
- Paternal support at one year of CA depended on whether the father had carried the infant in the KP during the neonatal period.
- Clear relation between paternal support at 1 year and the stability of the family 20 years later (score for paternal support in families without separated parents, 15.3 versus 14.6 for separated families, $P = 0.01$).

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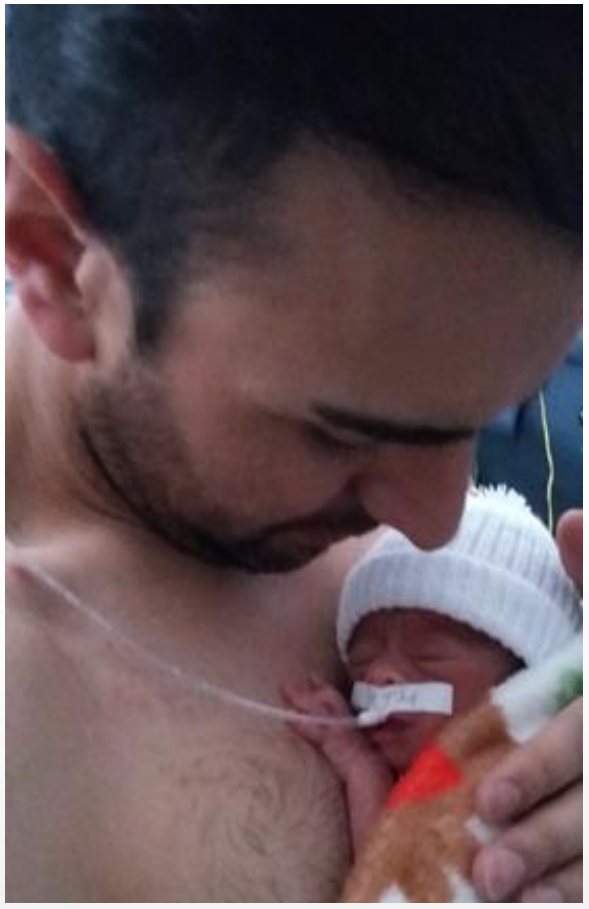

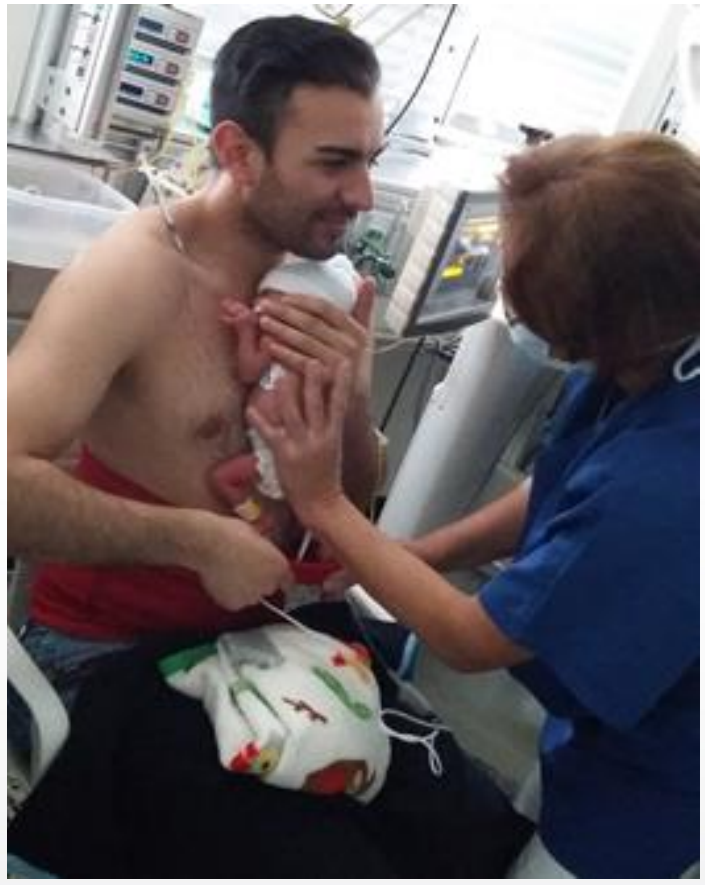

Main Findings (III)Social Behaviour

Mother's level of education	KMC		Controls		P		
	Low level	Higher level, mean (SD)	**Low level, mean (SD)**	Higher level, mean (SD)	KMC vs controls	Mother's level of education	Interaction mother's level of education and intervention
Conners hyperactivity, mean (SD)	**62 (10)**	65 (15)	**74 (14)**	60 (14)	0.15	0.01	**0.00**
Conners aggressivity, mean (SD)	**54 (12)**	54 (11)	**64 (15)**	53 (11)	0.03	0.00	**0.00**
ABCL DSM antisocial, mean (SD)	**69 (16)**	71 (14)	**78 (14)**	68 (16)	0.29	0.09	**0.02**
ABCL DSM internalization, mean (SD)	**72 (26)**	74 (24)	**82 (16)**	74 (22)	0.23	0.42	0.18
ABCL DSM externalization, mean (SD)	**63 (24)**	64 (22)	**79 (16)**	62 (23)	0.09	0.03	**0.00**

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Schooling, productivity, academic record, and work history

Variable	KMC (n=139)	Controls (n=125)	Difference	P-value
Years of preschool, mean (SD)	2.52 (1.07)	2.05 (1.04)	0.47 (0.14)	**0.00**
School absenteeism, mean (SD)	0.07 (0.26)	0.17 (0.37)	−0.09 (0.04)	**0.01**
Years of school, mean (SD)	11.31 (1.34)	11.50 (1.61)	−0.19 (0.18)	**0.15**
Wage per hour, mean (SD)	**4.77 (6.65)**	**3.13 (2.29)**	**1.65 (0.78)**	**0.02**

Wage per hour is given in thousand Colombian pesos; 1000 pesos is equivalent to US$ 0.40

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Main Findings (IV)Neuro-images

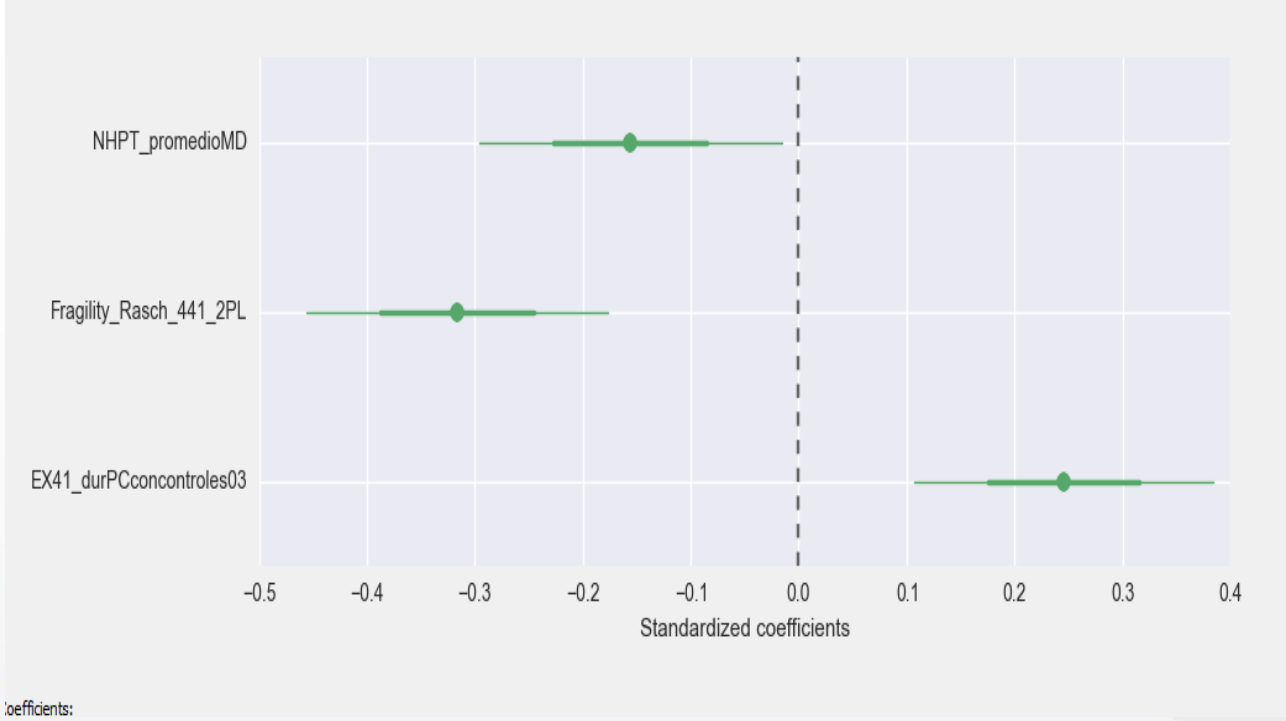
- KMC participants had significantly larger cerebral volumes of total grey matter, cerebral cortex, and the cerebral basal nuclei (caudate, putamen..).

Group allocation		Volumen cortex izquierdo	Volumen cortex derecho	Volumen cortex total	Volumen Gray Matter
1 KMC	Mean	216494	217362	433856	571762
	N	115	115	115	115
	Std. Deviation	26904	26874	53537	62041
2 Control	Mean	207926	208441	416367	552237
	N	98	98	98	98
	Std. Deviation	29598	28704	58062	65850
P value		0.03	0.02	0.02	0.03

Variables associated with left caudate nucleus volume at 20 years

Time	Variable	Slope	P
Before intervention	Fragility index	– 0.29	0.00
During intervention	Duration of kangaroo position	+ 0.25	0.00
At 20 years	Nine-hole peg test	– 0.18	0.01

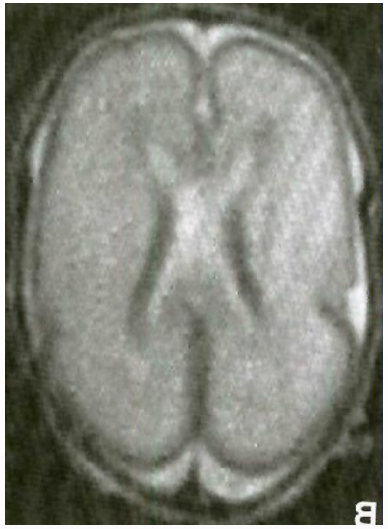
Results of linear regression (r^2) = 0.19 F (3.17) =12.21 *P*=0.00 calculated with Braviz software (25)



oefficients:

Food for thought What is the real problem of prematurity?

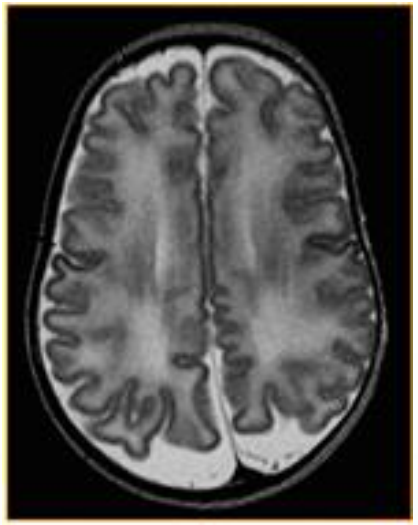
Brain of a premature infant compared to a term infant (Rueckert 2003)



Premature

Born at 25 weeks of GA

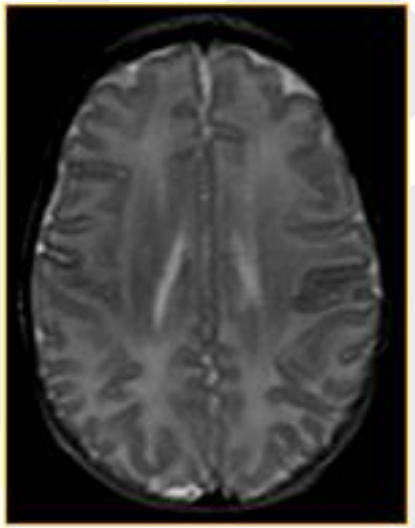
Brain at 25 weeks of GA



Premature

Born at 25 weeks of GA

Brain at 40 weeks of GA



Term infant

Born at 40 weeks of GA

Brain at 40 weeks of GA

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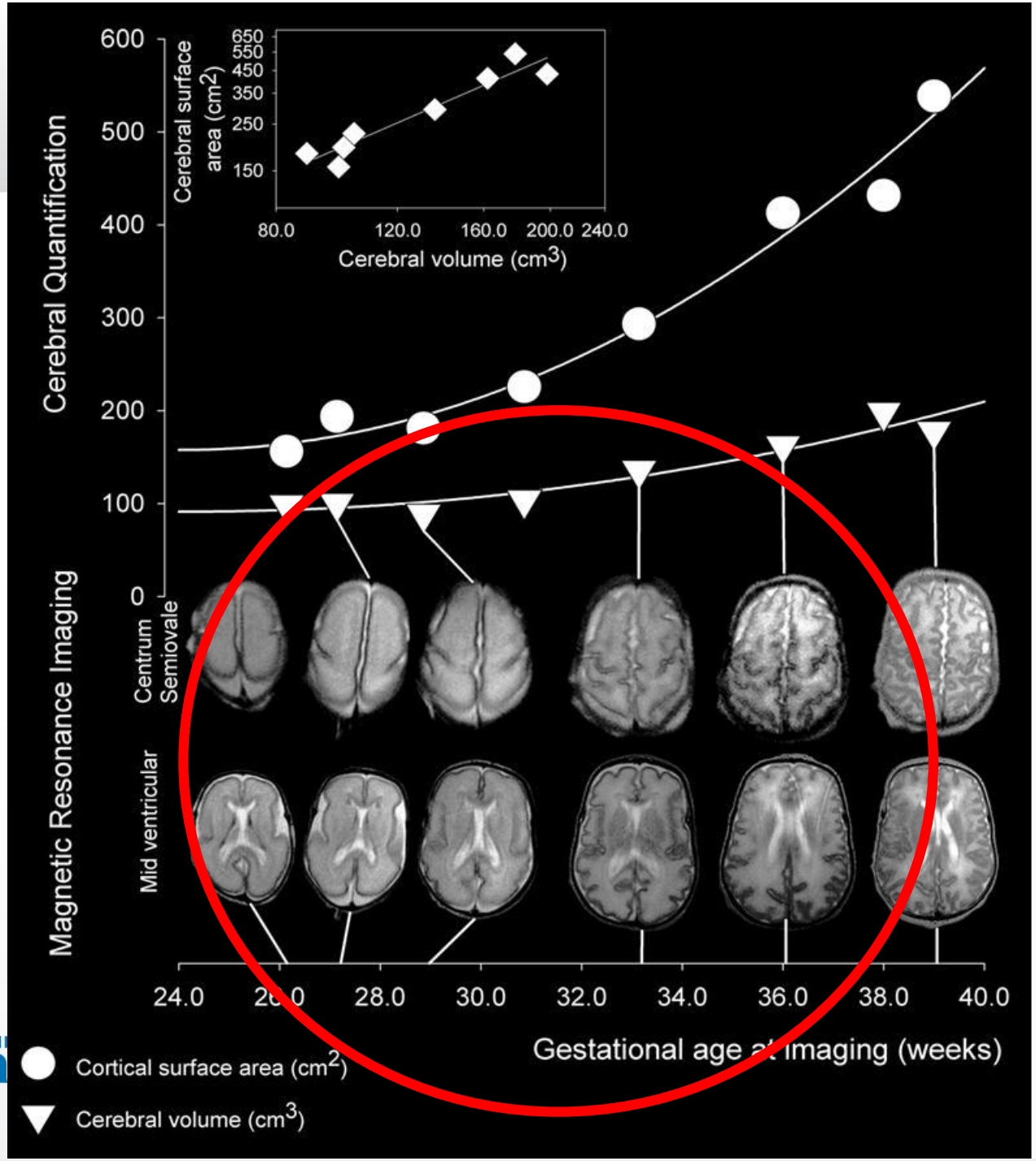

Macroscopic evolution of the brain between 24 and 40 weeks

Maturation of the brain

Brain cerebral volume increase x 1,5

Brain Cortex surface increase x 4

Cortesy *Frédérique BERNE AUDEOUD*

Impact time window: KMC care by parents since the beginning in the NICU

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Photo courtesy Pr Uwe Ewald

Parent chest = new care space

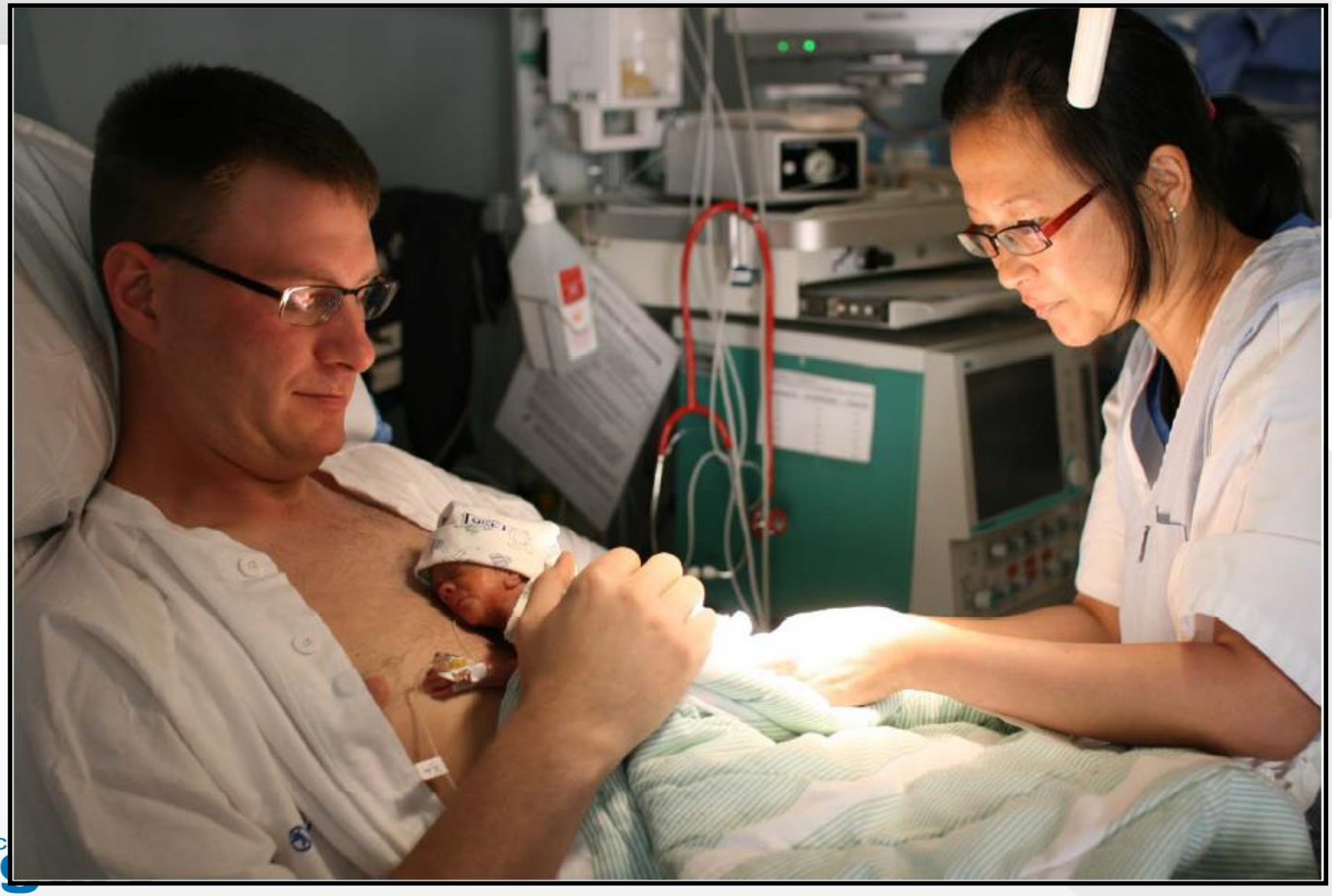

Photo courtesy Pr Uwe Ewald

Close, warm, monitoring, feeding….

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Photo courtesy Pr Uwe Ewald

Phototherapy

Photo courtesy Pr Uwe Ewald

Conclusion

KMC means:

1. Interaction between health, environment and development, which impact at the right moment (impact time window) the brain maturation ex-utero
2. Empowerment of parents who become progressively more aware of the child and more prone to sensitive and nurtured care during the first year of life.

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Thank you

It takes a long time to transform new idea into reality

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