Breastfeeding to prevent double burden of malnutrition

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Breast milk composition

- Special fluid that keep changing !!!???
  - Colostrum-Transitional milk-mature milk
  - Foremilk-Hindmilk
  - Premature milk-Fullterm milk

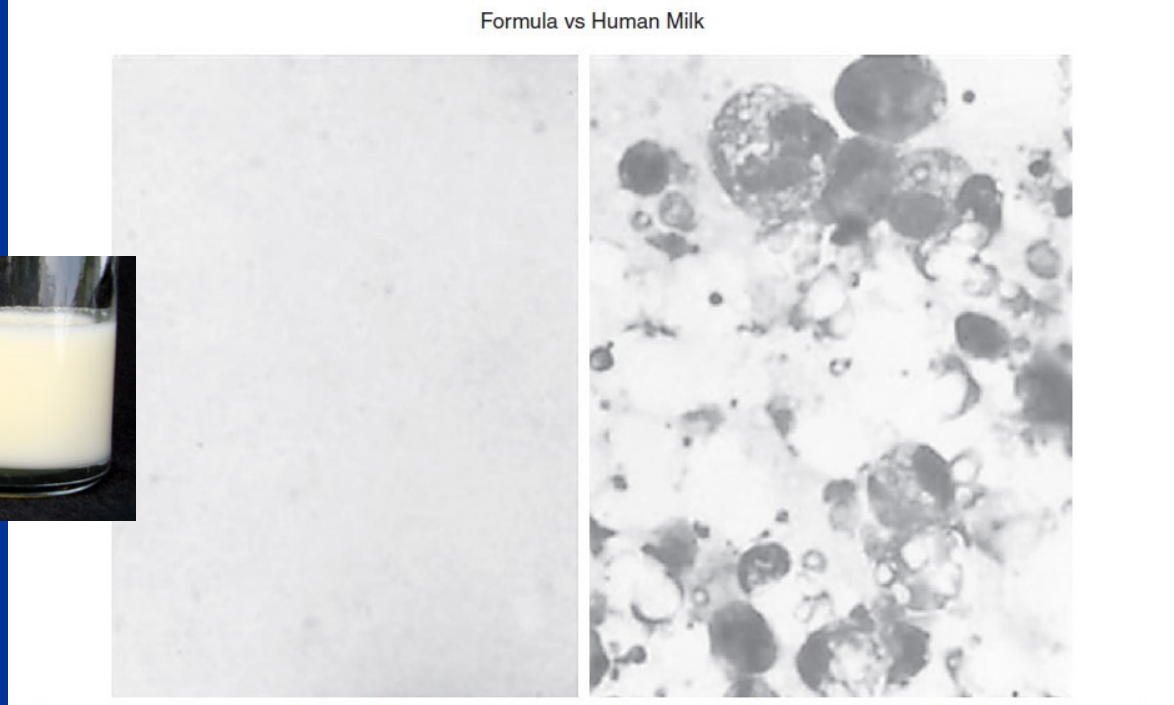

Figure 4-1. A comparison of formula *(left)* and human milk *(right)*. Human milk is a dynamic colloidal solution of perfect nutrients and growth factors for infant. Formula is a totally homogenized solution of nutrient chemicals. (Courtesy Nancy Wight, MD, San Diego, Calif.)

Nutrients in breast milk

- Macronutrients
  - Lipids-most important E source (50%)
  - Protein
  - Carbohydrate
- Micronutrients
  - Vitamins
  - Minerals

Composition/100ml	Colostrum	Mature milk	Cow milk	Codex standard
Energy (kcal)	58	65-70	64	60-70
Lipids (gm)	1.5-2.0	3.5-4.8	3.66	2.95-4.0
Carbohydrate (gm)	5-7	7.0-8.5	4.65	6.0-9.4
Lactose (gm)	2-5	6.7-7.0	4.5	
Oligosaccharides (gm)	2.2-2.4	1.2-1.4	Trace	
Glucose (gm)	0.02-0.1	0.02-0.03	NR	
Protein (gm)	1.5-2.0	0.8-1.1	3.2-3.5	1.2-2.0
Casein	0.38	0.3-0.5	2.7	
Whey	1.1-1.5	0.5-0.6	0.5	
α-lactalbumin	0.36	0.2-0.3	0.1	
β-lactoglobulin	-	-	0.36	
lactoferrin	0.35	0.1-0.3	Trace	
lysozyme	0.01-0.02	0.01	Trace	
serum albumin	0.4	0.3	0.04	
sIgA	0.2-1.2	0.05-0.1	0.003	
IgM	0.002	0.001	0.006	
IgG	0.001	0.005	0.003	
Non-protein nitrogen (gm)	0.05	0.045	0.02	

Lipids

- **LCPUFA** highest in breast milk >>>> cow's milk (saturated short/medium chain FA)
  - linoleic acid (C18:2, n-6)/α-linolenic (C18:3, n-3)
  - arachidonic acid (ARA ; C20:4, n-6)/ docosahexaenoic acid (DHA ; C22:6, n-3)
  - higher in premature human milk

Minda H et al. Acta Paediatr 2002;91(8):874-81.
Simmer K et al. Cochrane Database Syst Rev 2008;(1):CD000376.
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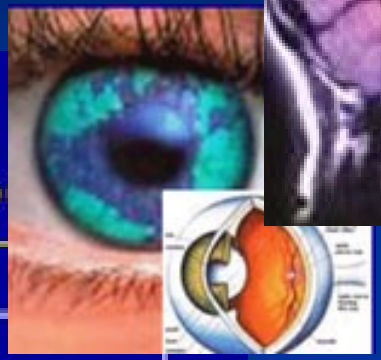
Kramer MS et al. Arch Gen Psychiatry 2008 May;65(5):578-84.

- **DHA is the largest PUFA source in the retina and in the brain**



Martinez M. *J Pediatr.* 1992;120:S129-S138.

Lipids

- **LCPUFA**
  - depends on maternal diet (oily fish, egg yolk, seaweed)
  - higher DHA in erythrocyte membrane lipids in BF vs FF
  - DHA+ Formula vs. DHA-Formula ??????
- **RCT: PROBIT study (*Promotion of Breastfeeding Intervention Trial)***
  - BF group has better cognitive function at 6.5 yrs

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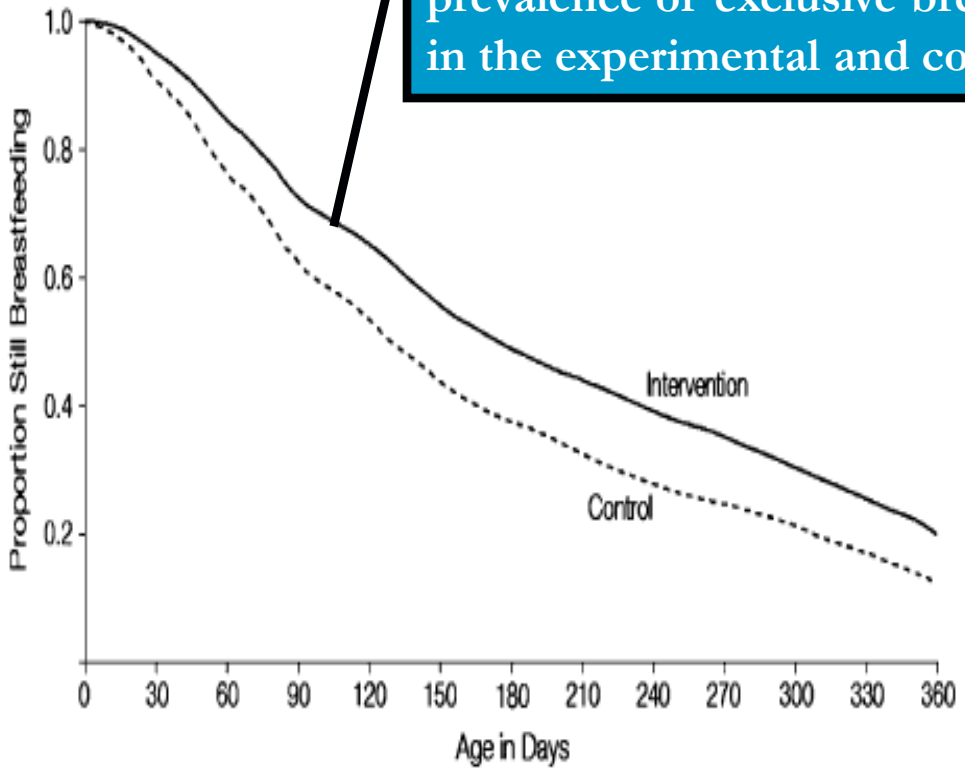
ORIGINAL ARTICLE

Breastfeeding and Child Cognitive Development

New Evidence From a Large Randomized Trial

Michael S. Kramer, MD; Frances Aboud, PhD; Elena Mironova, MSc; Irina Vanilovich, MD, MSc; Robert W. Platt, PhD; Lidia Matush, MD, MSc; Sergei Igumnov, MD, PhD; Eric Fombonne, MD; Natalia Bogdanovich, MD, MSc; Thierry Ducruet, MSc; Jean-Paul Collet, MD, PhD; Beverley Chalmers, DSc, PhD; Ellen Hodnett, PhD; Sergei Davidovsky, MD, MSc; Oleg Skugarevsky, MD, PhD; Oleg Trofimovich, BSc; Ludmila Kozlova, BSc; Stanley Shapiro, PhD; for the Promotion of Breastfeeding Intervention Trial (PROBIT) Study Group

prevalence of exclusive breastfeeding
in the experimental and control group at 3 mo =43.3% vs 6.4%)



crease 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.

Conclusion: These results, based on the largest randomized trial ever conducted in the area of human lactation, provide strong evidence that prolonged and exclusive breastfeeding improves children's cognitive development.

Trial Registration: isrctn.org Identifier: ISRCTN37687716

Arch Gen Psychiatry. 2008;65(5):578-584

Main Outcome Measures: Subtest and IQ scores on the Wechsler Abbreviated Scales of Intelligence, and

Table 3. Wechsler Abbreviated Scales of Intelligence Results

Outcome	Score, Mean (SD)		ICC	Cluster-Adjusted Mean Difference (95% CI)
	Experimental Group	Control Group		
Vocabulary (n=13 838)	53.5 (11.6)	46.9 (11.4)	0.28	+4.9 (+0.4 to +9.3)
Similarities (n=13 836)	56.6 (9.9)	50.7 (11.7)	0.29	+4.6 (+0.2 to +9.0)
Block designs (n=13 840)	57.2 (9.4)	54.6 (10.3)	0.21	+1.9 (–1.7 to +5.5)
Matrices (n=13 841)	52.8 (10.1)	50.9 (9.9)	0.20	+1.8 (–1.9 to +5.5)
Verbal IQ (n=13 828)	108.7 (16.4)	98.7 (16.0)	0.31	+7.5 (+0.8 to +14.3)
Performance IQ (n=13 836)	108.6 (15.1)	104.8 (15.4)	0.24	+2.9 (–3.3 to +9.1)
Full-scale IQ (n=13 824)	109.7 (15.4)	101.9 (15.8)	0.31	+5.9 (–1.0 to +12.8)

Abbreviations: CI, confidence interval; ICC, intraclass correlation coefficient.

Nutrients in breast milk

- Macronutrients
  - Lipids: most important E source (50%)
  - Protein:
  - Carbohydrate
- Micronutrients
  - Vitamins
  - Minerals

Fat-soluble vitamins

- Vitamin A
  - colostrum >> mature milk >>> cow's milk
  - retinol ester + carotenoids (→ lutein, zeaxanthine)
- Vitamin D
  - lower than DRI but adequate if 2 hour/week sun exposure
- Vitamin E
  - colostrum >> mature milk >>> cow's milk
  - adequate *(α-tocopherol:PUFA ratio 0.79 mg/gm)*
- Vitamin K
  - Universal vit K 1 mg IM at birth to prevent hemorrhagic disease of newborn

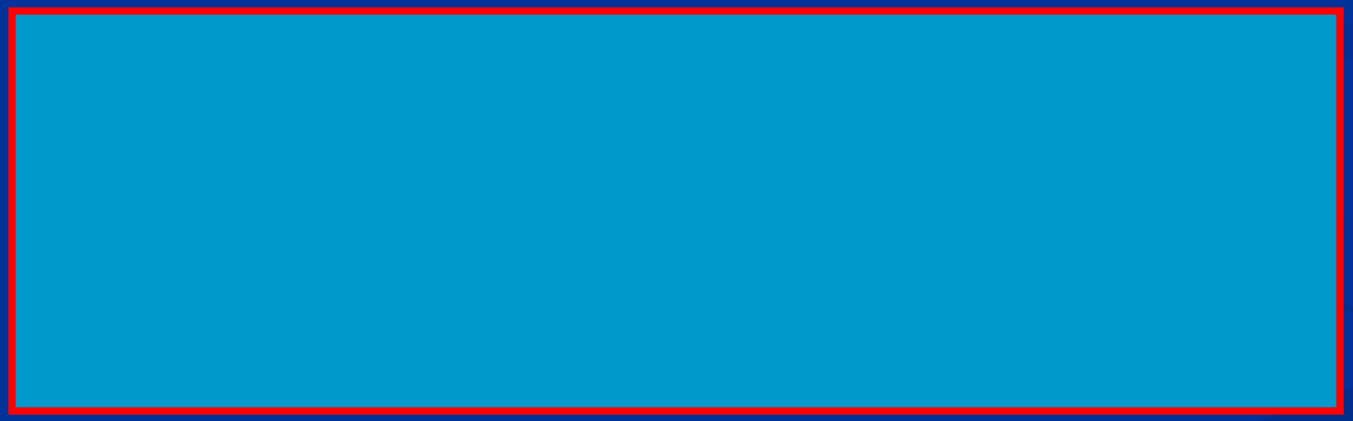
Water-soluble vitamins

- *depends on maternal diet > fat-soluble vitamins*
- Vitamin C
  - High in breast milk >>> cow's milk
- Vitamin B group
  - Adequate exc. Vegan mother (B6, B12)
  - Mother with B1 deficiency, thiaminase containing diets

Minerals

- Breast milk has low osmolarity, renal solute load
- Adequate Na, K, Cl
- Lower Ca than cow's milk but good absorption, Ca:P ratio 2:1
- Inadequate Ca, P for premature infants
- High bioavailability of trace element
- Fe 20-50% availability, adequate for 'healthy full-term' infants until 6 mos.

Influence of maternal diet on milk composition

- Little or no effect
  - Lactose concentration
  - Macromineral concentration (Ca, P, Mg)
  - Some trace elements (Fe, Zn, Cu)
  - Electrolytes (Na, K, Cl)
- Minimal effect, except severe malnutrition
  - Protein (conc./composition)
  - Non-protein nitrogen (conc./composition)
- 

Donovan SM. In: Duggan C, Watkins JB Walker WA, editors. Nutrition in Pediatrics: Basic science and clinical applications. 4th ed. 2008. p. 341-54.

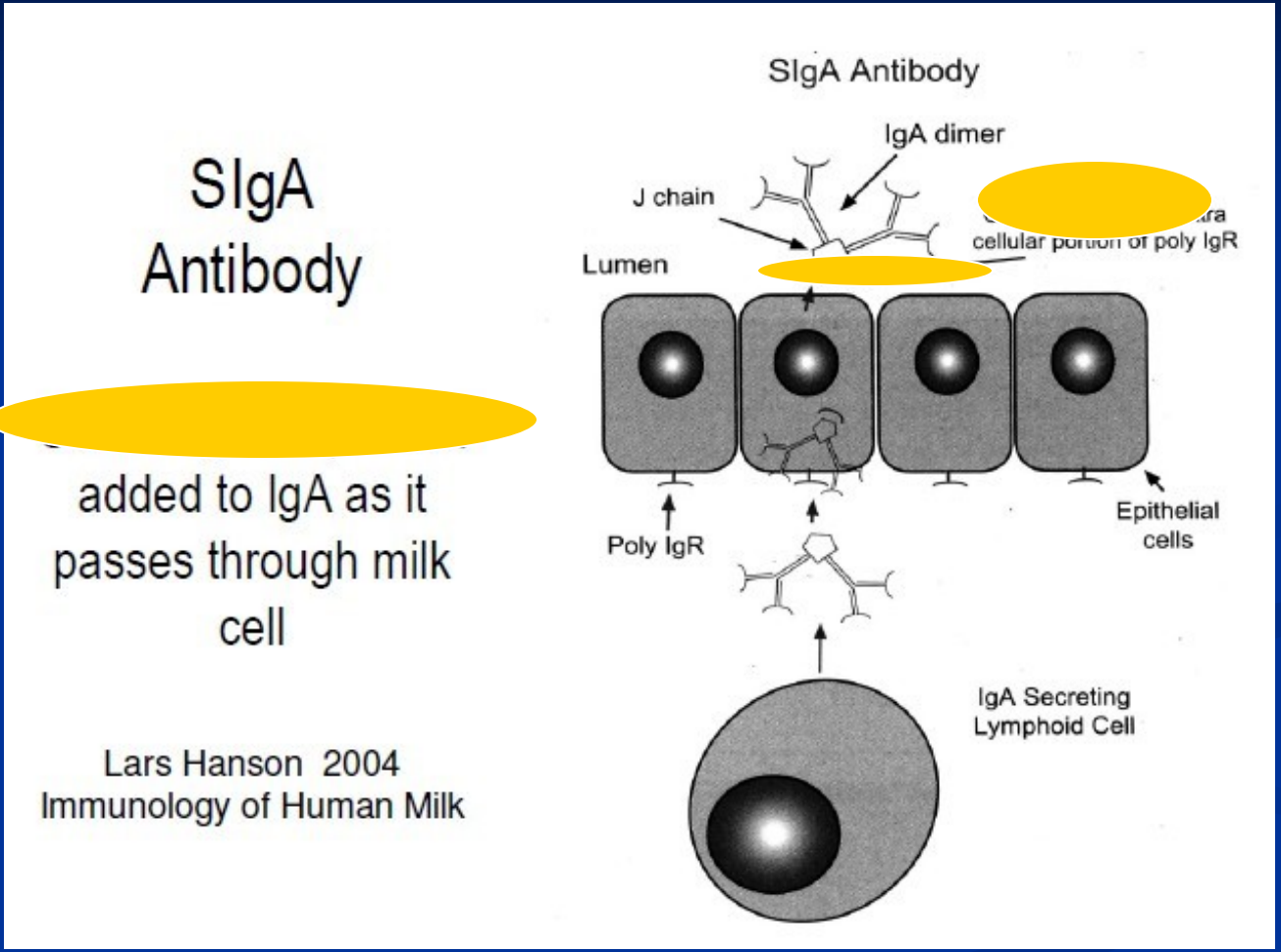
Production of breast milk is robust! Breast milk still contain protective factors regardless.

Who should we give 'extra' supplement to ??? A. Mother B. Baby

Non-nutritive factors in breast milk

- **Secretary IgA** (90% of total Ab)
  - very high in colostrum 0.2-1.2 gm/dL (twice adult sIgA produced per day), 0.1 gm/dL in mature milk
  - Protects mucosal surfaces eg gut, respiratory tract immediately after birth
  - Composed of specific antibodies against bacteria that mother has encountered in the environment (appear in milk around 1 day after mother infected)
  - Infant starts to make its own SIgA after some weeks → takes much longer in less exposed infants

Secretary IgA in breast milk



- ***the secretory component protects them from digestion***
- ***2-4 grams sIgA per litre presents in infant's stool***

Non-nutritive factors in breast milk

- Living immunity →
  - Macrophages and neutrophils
    - May protect mammary gland against infectious mastitis
    - May kill microbes in baby's gut
    - Macrophages make lysozyme secreted in milk
  - Lymphocytes – B and T cells
    - May enter infant's body and transfer immune functions
    - mother's cells tolerated by baby
    - enhanced response to vaccines
    - increased tolerance to kidney transplant from mother

Non-nutritive factors in breast milk

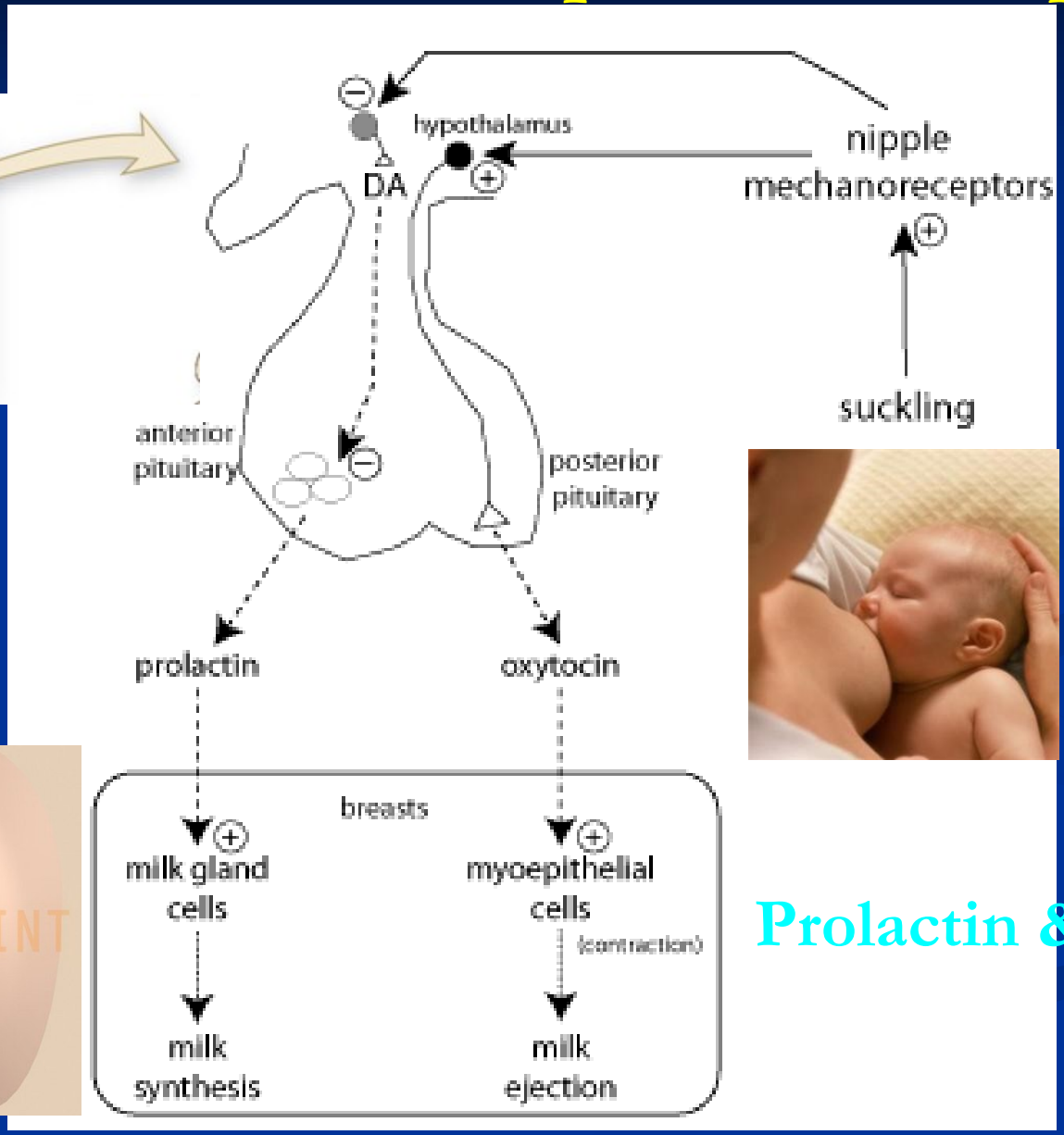
- **Lactoferrin → binds iron which inhibits bacterial growth, kills bacteria, viruses and Candida**
- **Lysozyme** → breaks down cell walls of many bacteria
- **Oligosaccharides** → stop bacteria attaching to epithelium, prebiotics effects
- **Nucleotides** → building blocks of nucleic acids; enhance maturation of immune system

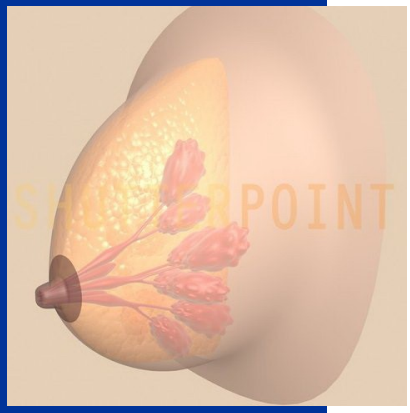
Non-nutritive factors in breast milk

- > 100 cytokines+immunomodulatory factors→ do not cause inflammation e.g TGF-β *(Transforming Growth Factor beta)*
- Epidermal growth factors
- Hormones: leptin, thyroid hormones, erythropoietin, prolactin
- Enzymes: bile salt-stimulated lipase

How to maintain adequate milk supply?

How to maintain adequate milk supply?





Prolactin & Oxytocin

How to maintain adequate milk supply?

Early stage:

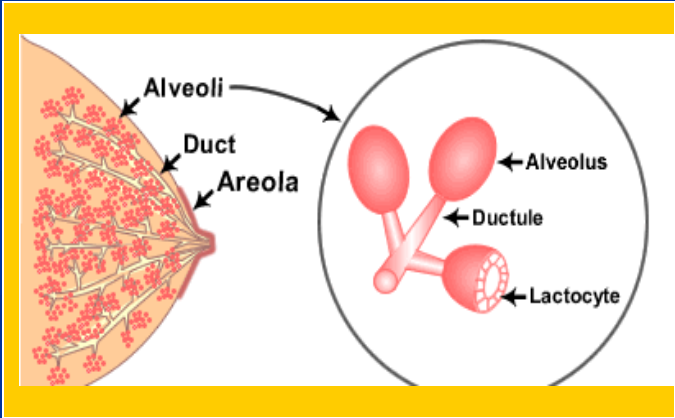
- Frequent + effective nursing
  - Every 1-3 hours esp. during the night!!!
- Rooming-in + maternal confidence/support

Later stage (after 4-6 weeks)→ LOCAL control:

- Breast emptying (one at a time!)
- Demand & supply

Full breast → Slower milk production

Empty breast → Faster milk production



What to eat during lactation?

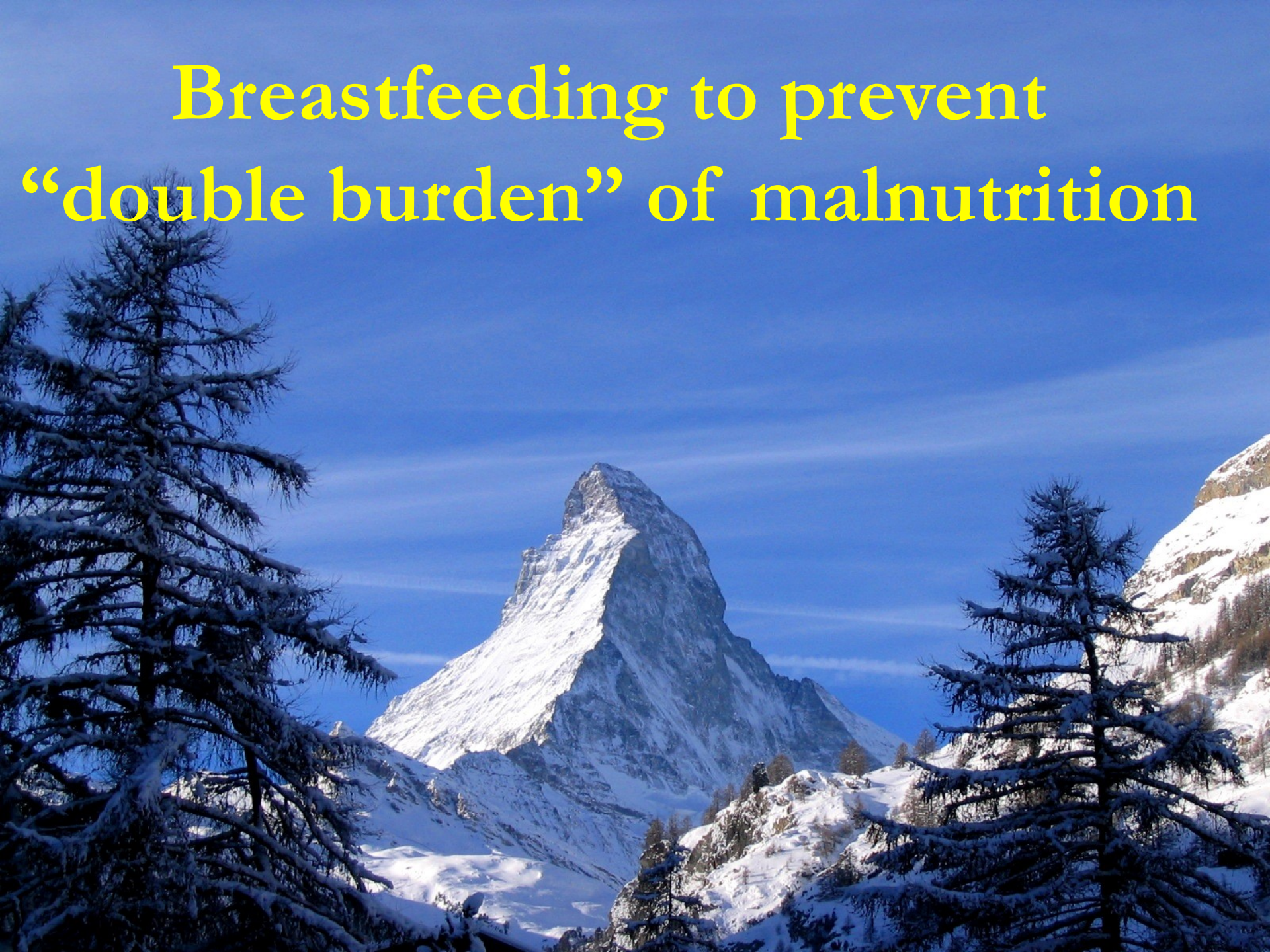
- Exclusive breast feeding mother need
  - Extra energy 500 kcal/day, protein 15-25 gm/day
  - Adequate water
  - Beware of maternal malnutrition
    - vitamin B group e.g. B_1, B_{12}
    - vitamin D
  - Calcium, Phosphorus, Iron, Copper, Folate, Iodine22

What to eat during lactation?

- Hypoallergenic diet ????
  - Diary product, fish, egg, peanut avoidance during lactation

- Galactogogue ???

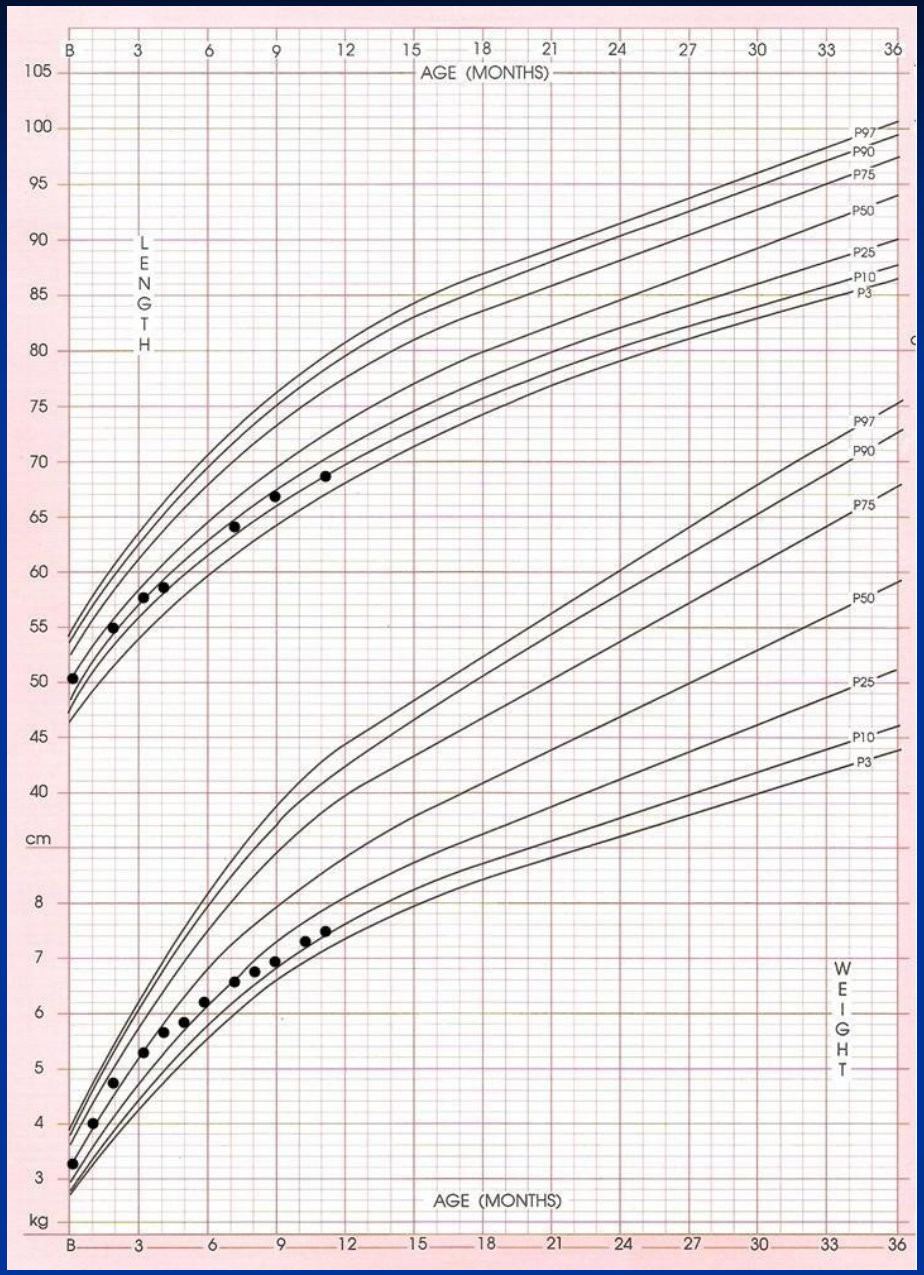
Breastfeeding to prevent "double burden" of malnutrition



Slow weight gain in breastfed baby

- BF baby → normal/faster growth in 1st 4-6 months
- Then slower growth rate → become leaner than FF baby by the end of 1st year
- Weight deviate from standard growth chart (combine FF>>BF)!
- WHO child growth standard (http://www.who.int/childgrowth/)

Dewey et al. Pediatrics 1992; 89: 1035-41
Dewey KG. Pediatr Clin North Am 2001; 48: 87-104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P10
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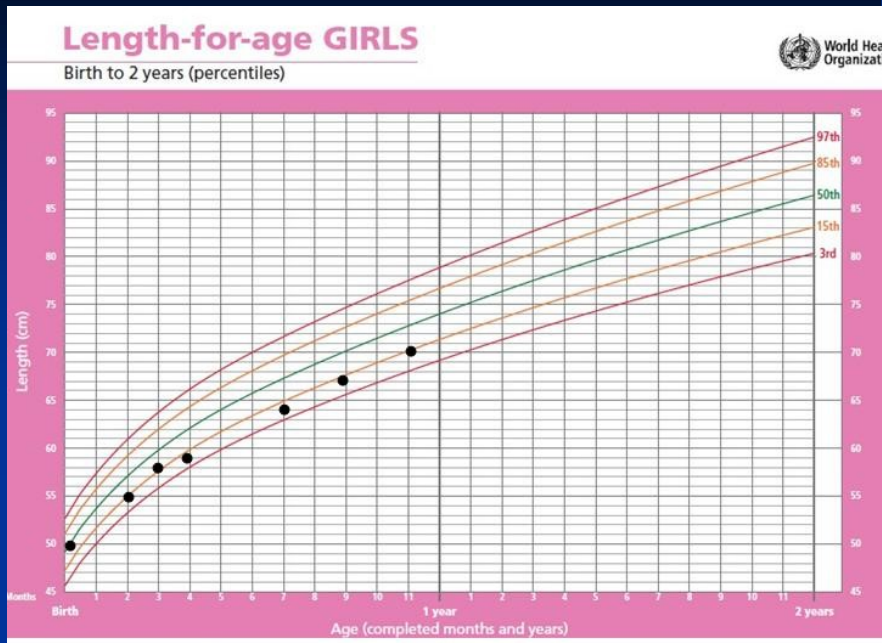
kg


Length-for-age GIRLS
Birth to 2 years (percentiles)
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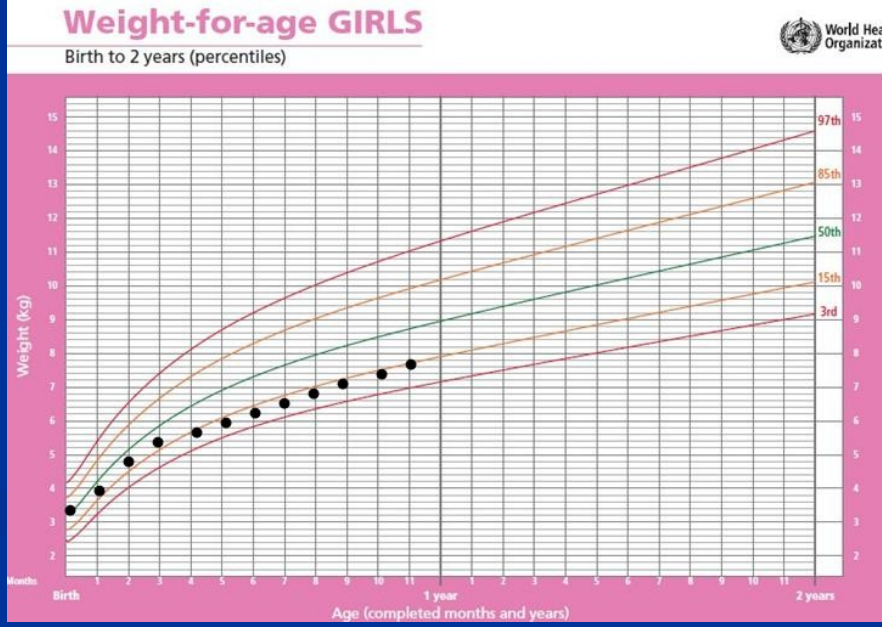
Age (completed months and years)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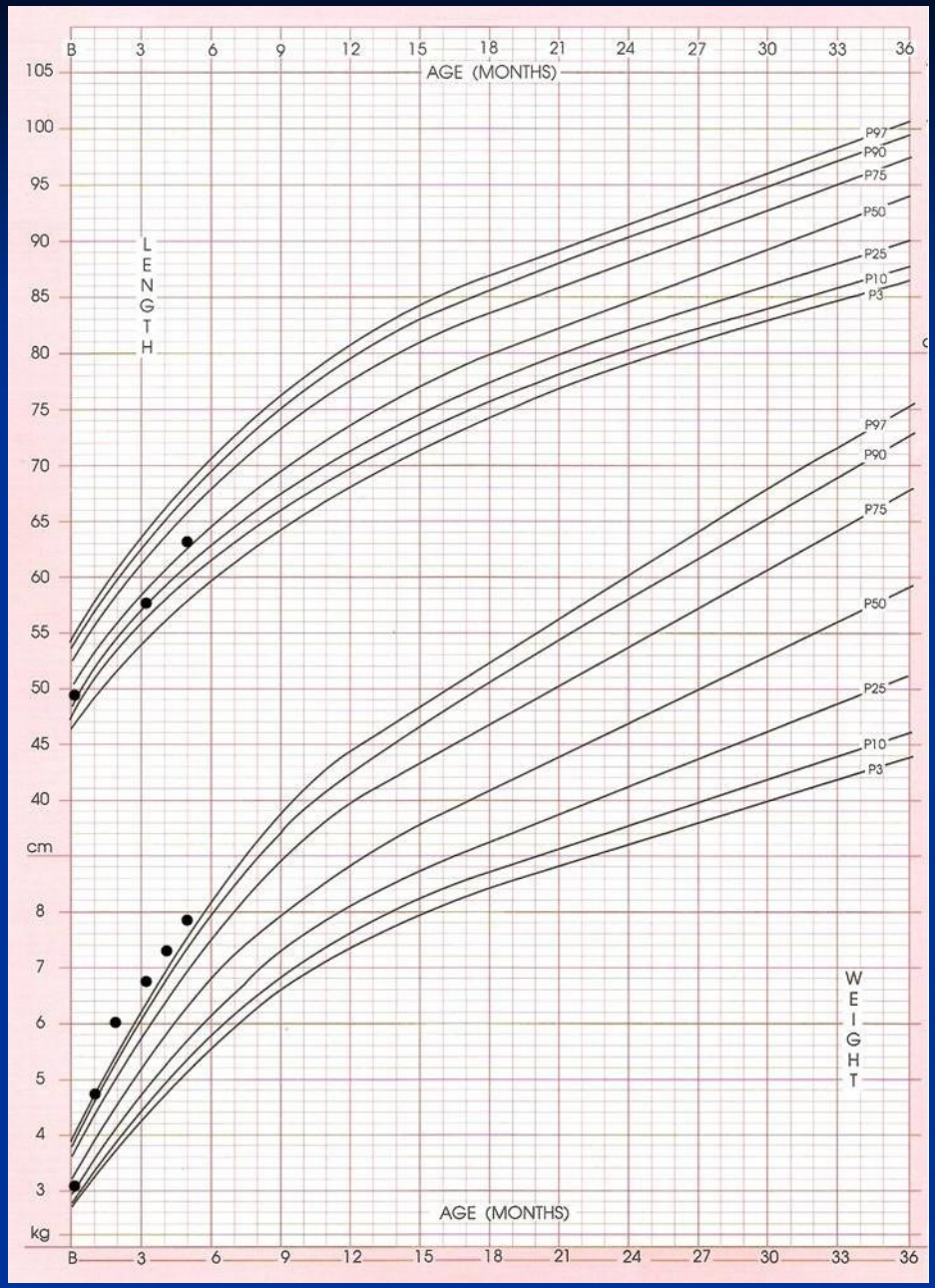
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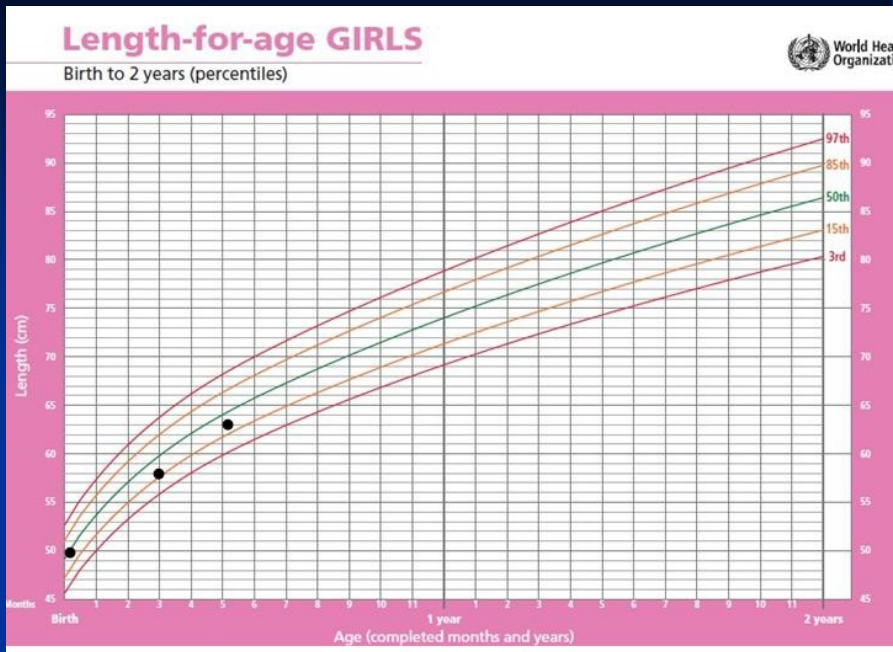
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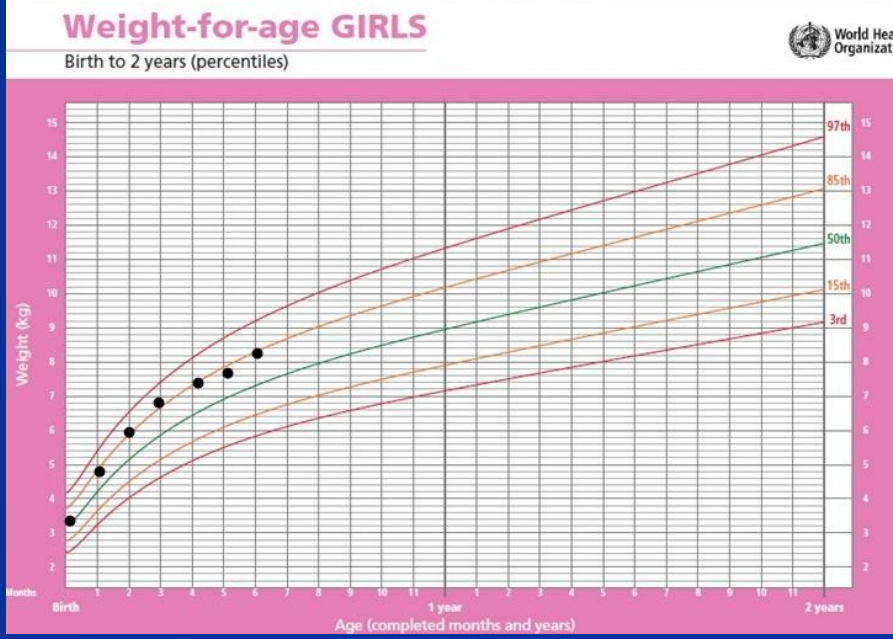
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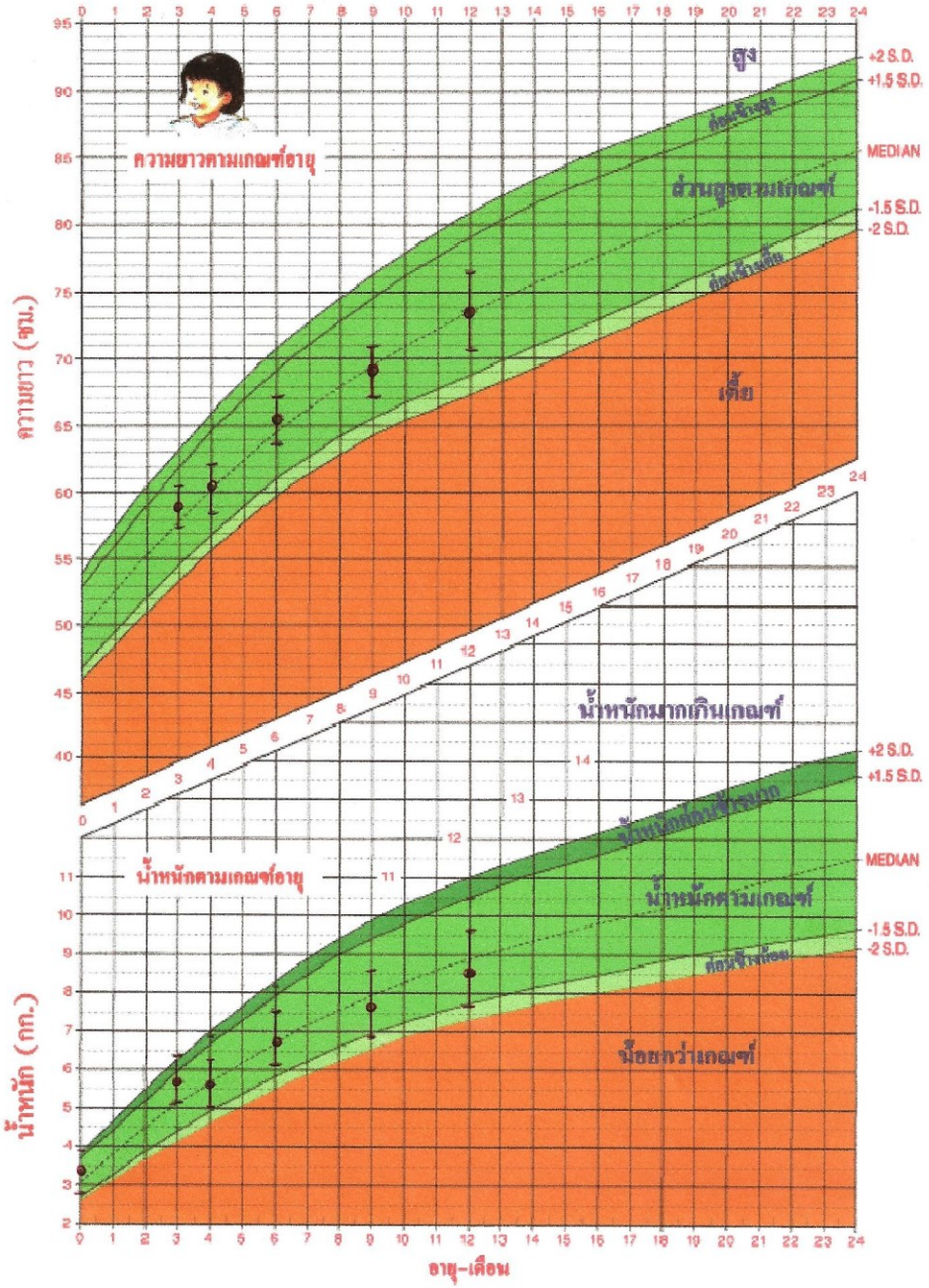
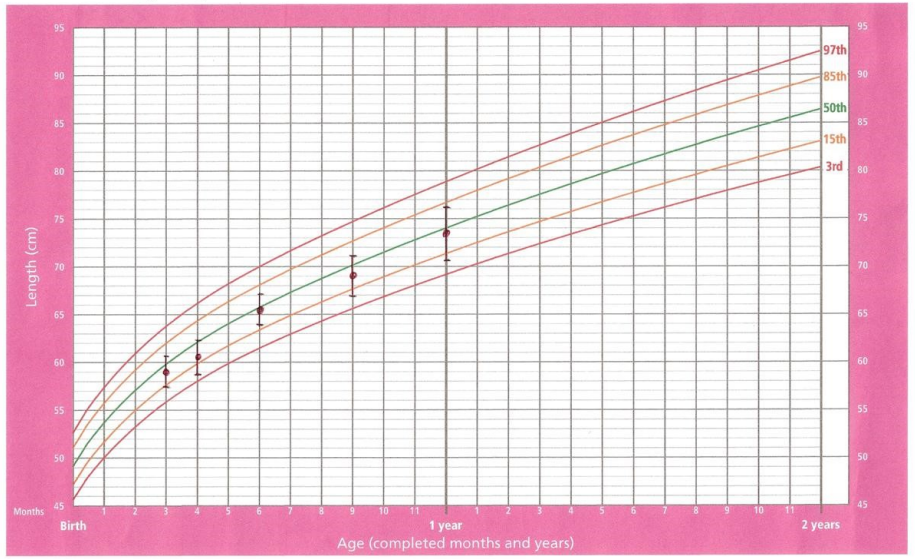
กราฟแสดงเกณฑ์อ้างอิงการเจริญเติบโต ของเพศหญิง อายุ 0–2 ปี



Length-for-age GIRLS

World Health Organization

Birth to 2 years (percentiles)

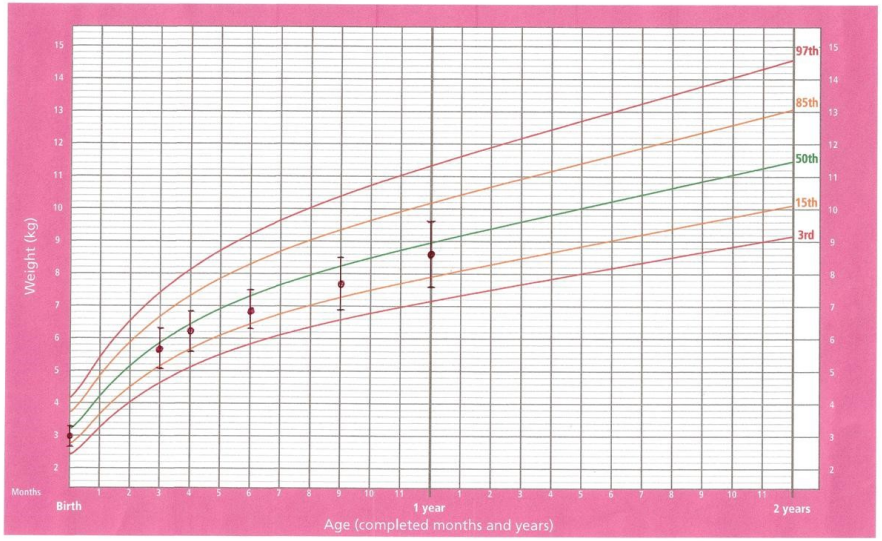


WHO Child Growth Standards

Weight-for-age GIRLS

World Health Organization

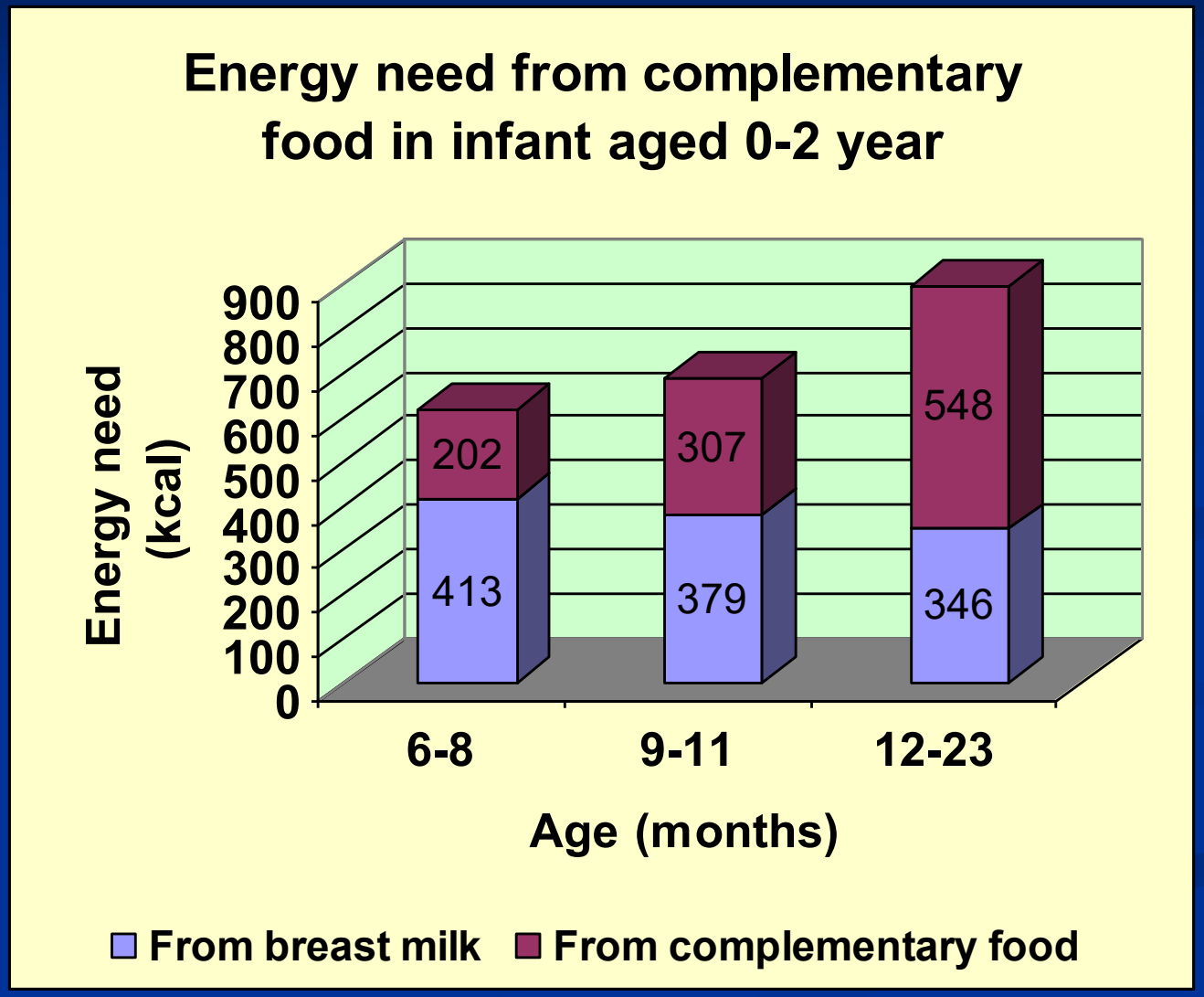
Birth to 2 years (percentiles)



WHO Child Growth Standards

Complementary food

“อาหาร (เสริม) ตามวัย”



Dewey KG and Brown KH. Food Nutr Bull 2003; 24:5-28

Some problem nutrients in BM?

BF vs Iron????

Incidence and Risk Factors of Iron Deficiency Anemia in Term Infants

Supapan Tantracheewathorn MD*,
Sirin Lohajaroensub MSc**

Presented at the 57th Thai Congress of Pediatrics, Surat Thani, Thailand, April 21-23, 2004
** Department of Pediatrics, Bangkok Metropolitan Administration Medical College and Vajira Hospital*
*** Medical Laboratory Department, Bangkok Metropolitan Administration Me*

Objective: *To compare the incidence of iron deficiency anemia (IDA) betwee fed (FF) infants and to identify the risk factors of IDA in these infants.*
Design: *Cohort study.*
Material and Method: *A study of 140 full- term infants (70 BF and 70 FF) College and Vajira Hospital from February 2002 to November 2003. All inf 1, 2, 4, 6, 9 and 12 months for growth and developmental assessment. Bl hemoglobin (Hb), hematocrit (Hct) and mean corpuscular volume (MCV) a Hb < 11.0 g/dl were further investigated for the cause of anemia.*
Results: *The mean values of Hb, Hct, MCV and serum ferritin of BF infants w 16.7 ng/ml respectively, which were significantly lower than those of FF infan 36.9 ng/ml, p < 0.05). Anemia was found in 27 BF infants (38.6%) compared incidence of IDA in BF infants was significantly higher than FF infants (2. factors of IDA included low birth weight, breastfeeding and inadequate co (95% CI): 3.1(1.1-9.1), 6.3(1.5-25.0), 7.7(2.8-20.0), respectively).*
Conclusion: *IDA is more prevalent in BF than FF infants. Risk factors of IDA ar and inadequate complementary food. Prevention of IDA in infants should iron-rich complementary food and screening for Hb or Hct at 9-12 months o*

Keywords: *Anemia, Breastfeeding, Formula feeding, Infant, Iron deficiency*

J Med Assoc Thai 2005; 88(1): 45-51
Full text. e-Journal: *http://www.medassocthai.org/journal*

Table 2. Hematologic data at 9-12 months of age

	Breast-fed infants n = 70	Formula-fed infants n = 70	p
Hemoglobin, g/dl +	10.8±1.1 (8.3-12.4)	11.4±0.7 (9.0-12.6)	<0.001*
Hematocrit,%+	32.8±3.3 (24.5-42.0)	35.1±2.4 (27.2-39.1)	<0.001*
MCV, fl+	70.9±6.3 (47.2-83.2)	73.3±3.8 (62.2-81.4)	0.009*
No. of anemic infants, (%)	27 (38.6)	10 (14.3)	0.004*
No. of infants with IDA, (%)			<0.001*

+ mean ± SD (range), * p < 0.05

Iron supplementation of breastfed infants from an early age[1–3]

Ekhard E Ziegler, Steven E Nelson, and Janice M Jeter

ABSTRACT

Background: In breastfed infants, iron deficiency at <6 mo of
although uncommon, is observed in industrialized countries.
supplementation starting at an early age may prevent iron
ciency.

Objective: The study assessed the effect of early iron supplem
tion of breastfed infants and tested the hypothesis that iron su
mentation enhances iron status. Potential adverse effects (toler
and growth) were monitored.

Design: The prospective, placebo-controlled study involved e
sively breastfed infants who were randomly assigned at 1 m
age to iron ($n = 37$) or placebo ($n = 38$). Iron (7 mg/d as m
vitamin preparation with ferrous sulfate) or placebo (multivit
preparation without iron) was given from 1 to 5.5 mo of age.
plementary foods were allowed at >4 mo. Infants were follo
to 18 mo. Blood concentrations of ferritin, transferrin rece
hemoglobin, and red cell indexes were determined at bimo
intervals. Stool consistency and color and feeding behavior
recorded.

Results: Iron supplementation caused modest augmentation of
status during the intervention at 4 and 5.5 mo but not thereafter.
supplements were well tolerated and had no measurable effe
growth. One infant developed iron deficiency anemia by 5.5 m
age. Plasma ferritin and hemoglobin tracked over time.

Conclusion: Early iron supplementation of breastfed infants is fea-
sible and transiently increases iron status but not hematologic status.
Iron is tolerated by most infants.

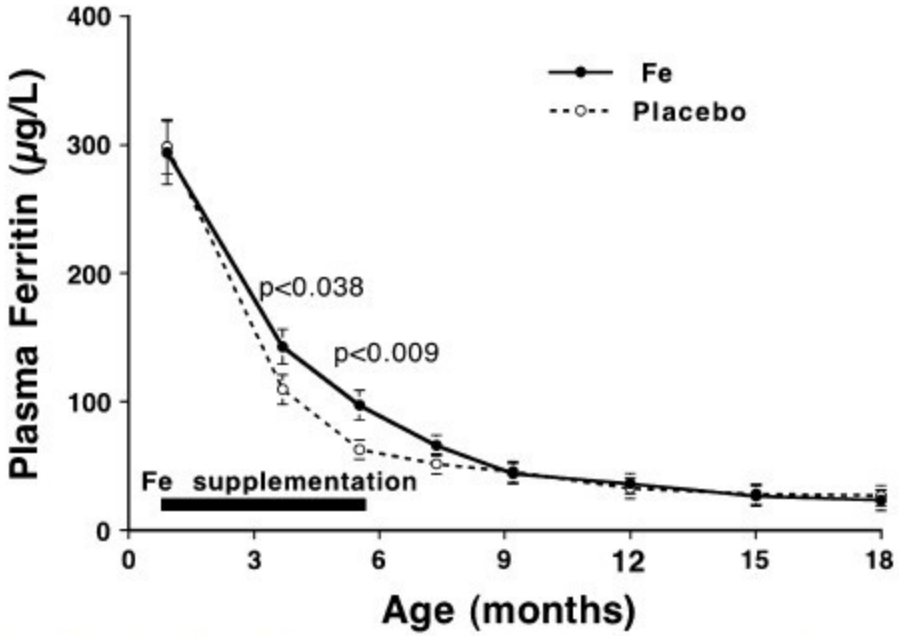


FIGURE 2. Adjusted plasma ferritin (PF) concentration (adjusted for current weight and PF at 1 mo) between 1 and 18 mo. Iron supplementation ($n = 31$) and placebo ($n = 32$) subjects at 1 through 5.5 mo, with fewer at later ages. The horizontal bar indicates the intervention period. Error bars indicate SE. P values refer to comparisons between iron supplementation and placebo by ANCOVA. The age × treatment interaction was statistically significant at $P = 0.001$.

Am J Clin Nutr 2009;89:525–32.

Effect of Iron Supplementation on Development of Iron Deficiency Anemia in Breastfed Infants

	Supplemented group ($n = 51$)	Control group ($n = 54$)	p-values
Gender (male)	56.9%	38.9%	0.07
Mode of delivery (caesarean section)	64.7%	51.9%	0.10
Mean Birthweight (g)	3407.7	3500.9	0.27
Mean Gestational age (weeks)	39.4%	39.1%	0.20
Mother's age (>35)	18.8%	31.5%	0.14
Father's education level (university)	56.3%	33.3%	0.06
Mother's education level (university)	52.1%	31.5%	0.11
History of acute disease	5.9%	1.9%	0.35

	Groups		Total, n (%)
	Supplemented ($n = 51$), n (%)	Control ($n = 54$), n (%)	
Only breast milk	23 (45.1)	30 (55.6)	53 (50.5)
Breast milk+water	1 (2)	0	1 (1)
Breast milk+ fruit juice	1 (2)	2 (3.7)	3 (2.9)
Breast milk+ formula	2 (3.9)	2 (3.7)	4 (3.8)
Breast milk+ mixed[a]	24 (47.1)	20 (37.0)	44 (41.9)

[a]Mixed: Home-made complementary foods.

Variable	Group	*N*	Mean (SD)	*p*
Hb in pregnancy (g dl^{-1})	Supplemented	12	12.0 (1.6)	0.45
	Control	11	12.2 (0.9)	
Mother's Hb (g dl^{-1}) at 6 months	Supplemented	39	13.3 (0.8)	0.30
	Control	46	13.5 (0.7)	
Hb at 6 months (g dl^{-1})	Supplemented	51	11.3 (0.6)	0.89
	Control	54	11.4 (0.5)	
Hb at 12 months (g dl^{-1})	Supplemented	51	11.4 (0.9)	0.33
	Control	54	11.2 (0.8)	
Iron intake in diet (% of RDA[a])	Supplemented	35	43.3 (19.3)	0.11
	Control	37	53.1 (24.0)	

[a]RDA: 11 mg day^{-1}.

Summary

This trial aimed to investigate the effect of iron supplementation on the development of iron deficiency anemia. The study encompassed 6-month-old infants who had been exclusively breastfed in the first 4 months of life. Infants in the supplemented group were given 1 mg $kg^{-1}day^{-1}$ ferrous sulfate for 6 months starting at 6 months of age. Blood samples were taken at age 12 months. A 3-day-diet was evaluated at 1 year of age. Data of 51 infants in the supplemented and 54 infants in the control group were analyzed. Mean hemoglobin values were similar in the two groups at the age of 12 months. Mean ferritin level of the supplemented group was significantly higher than that of the control. There was a significant [redacted] Nutrition might be [redacted]portant than iron supplementation in preventing iron deficiency anemia during infancy.

r=0.306, p=0.009

How to prevent iron deficiency in Thai infants?

- Prevention of maternal iron deficiency/anemia during pregnancy?
- Delayed cord clamping?
- Screening in infants at risk?
- Iron supplement medication?
  - Iron tolerance and compliance
  - Adverse effect of iron e.g. saturation of lactoferrin
- Food fortification?

How to prevent iron deficiency in Thai infants?

- Advice re: complementary food high in iron!

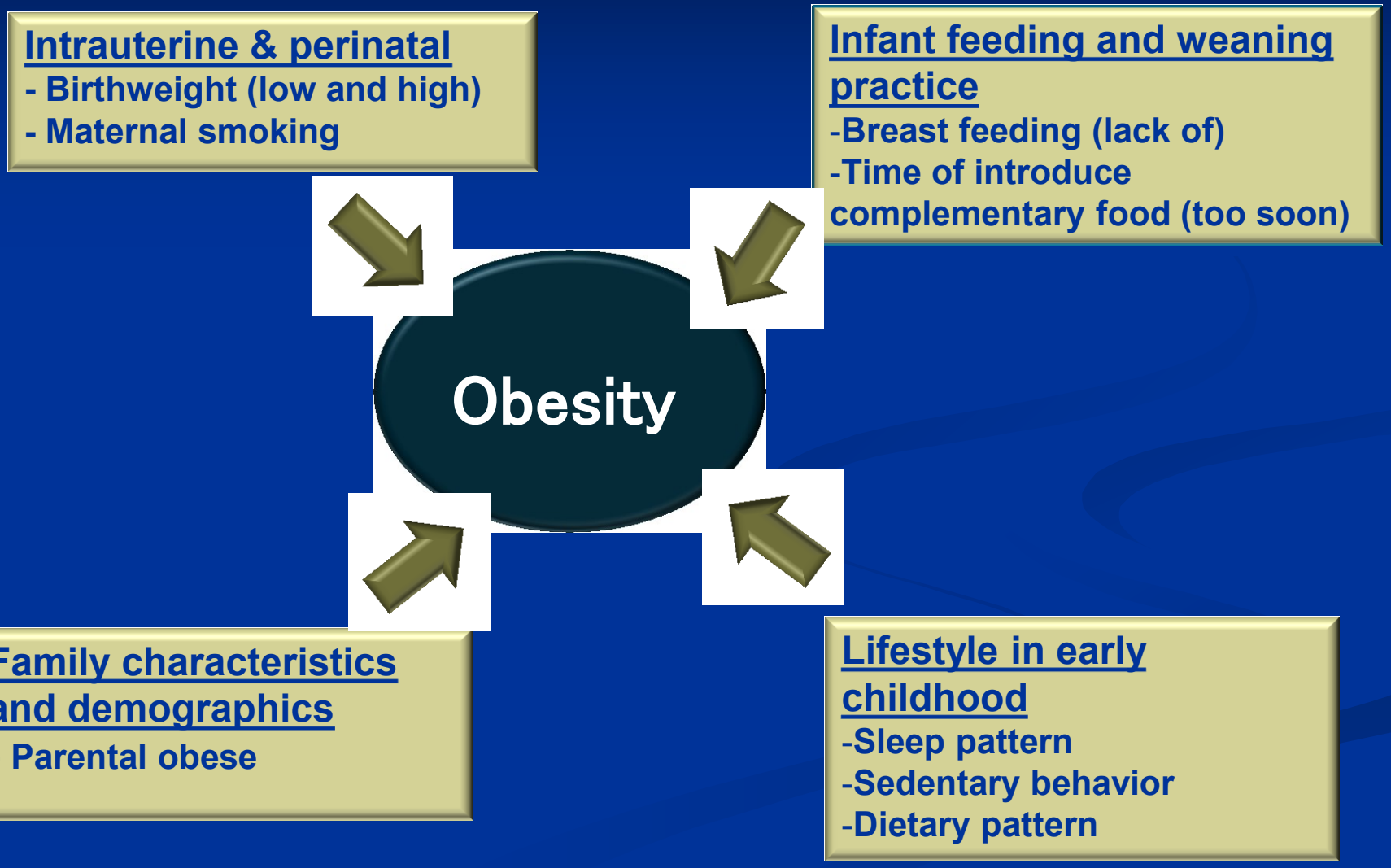






Long term effect of breastfeeding in obesity prevention

Early life risk factors for obesity in childhood



John J Reilly, Andrea Sherriff ,et al. Early life risk factors for obesity in childhood: cohort study. BMJ 2005;10:1-7.

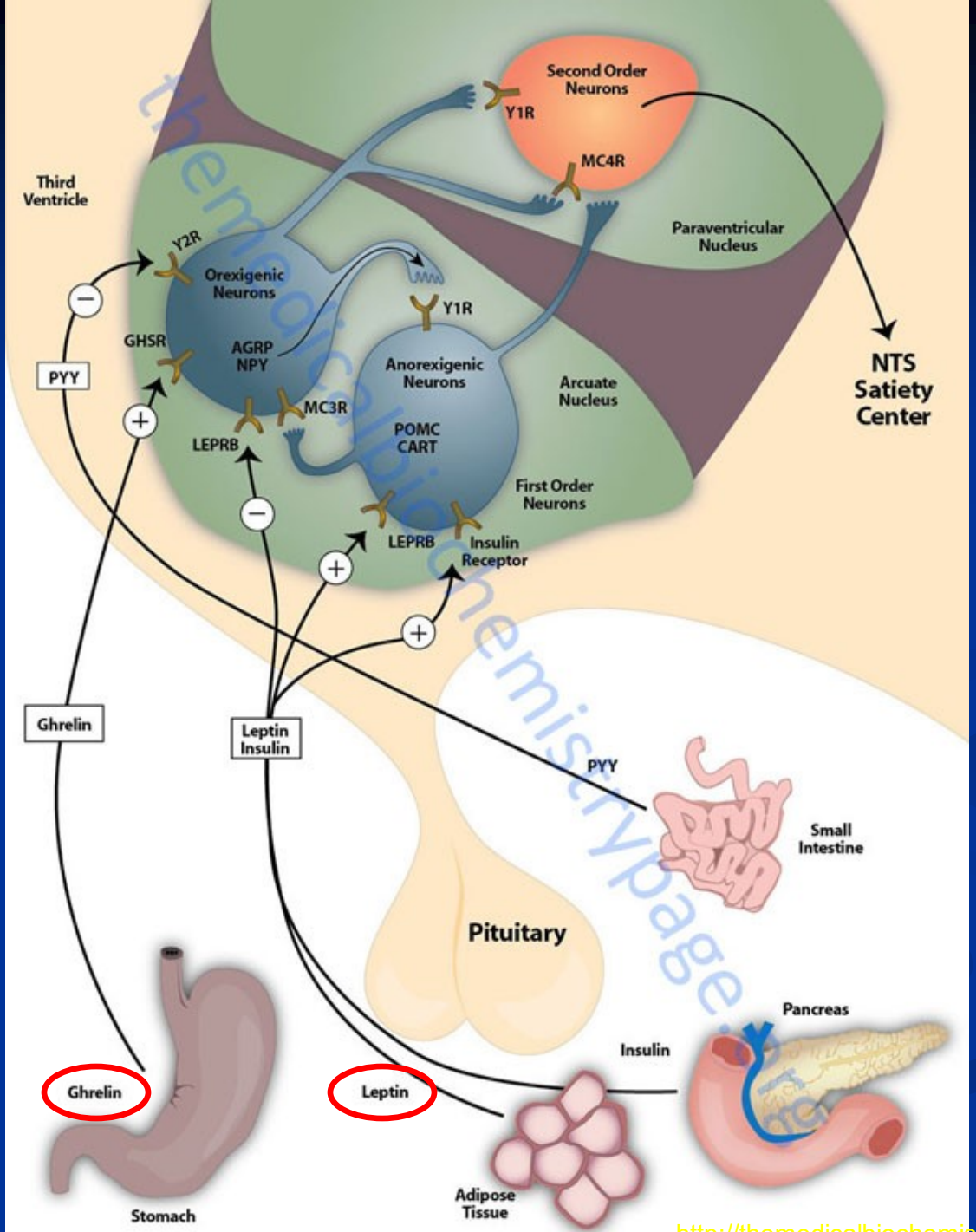
Potential causes for the protective effects of breastfeeding on later obesity

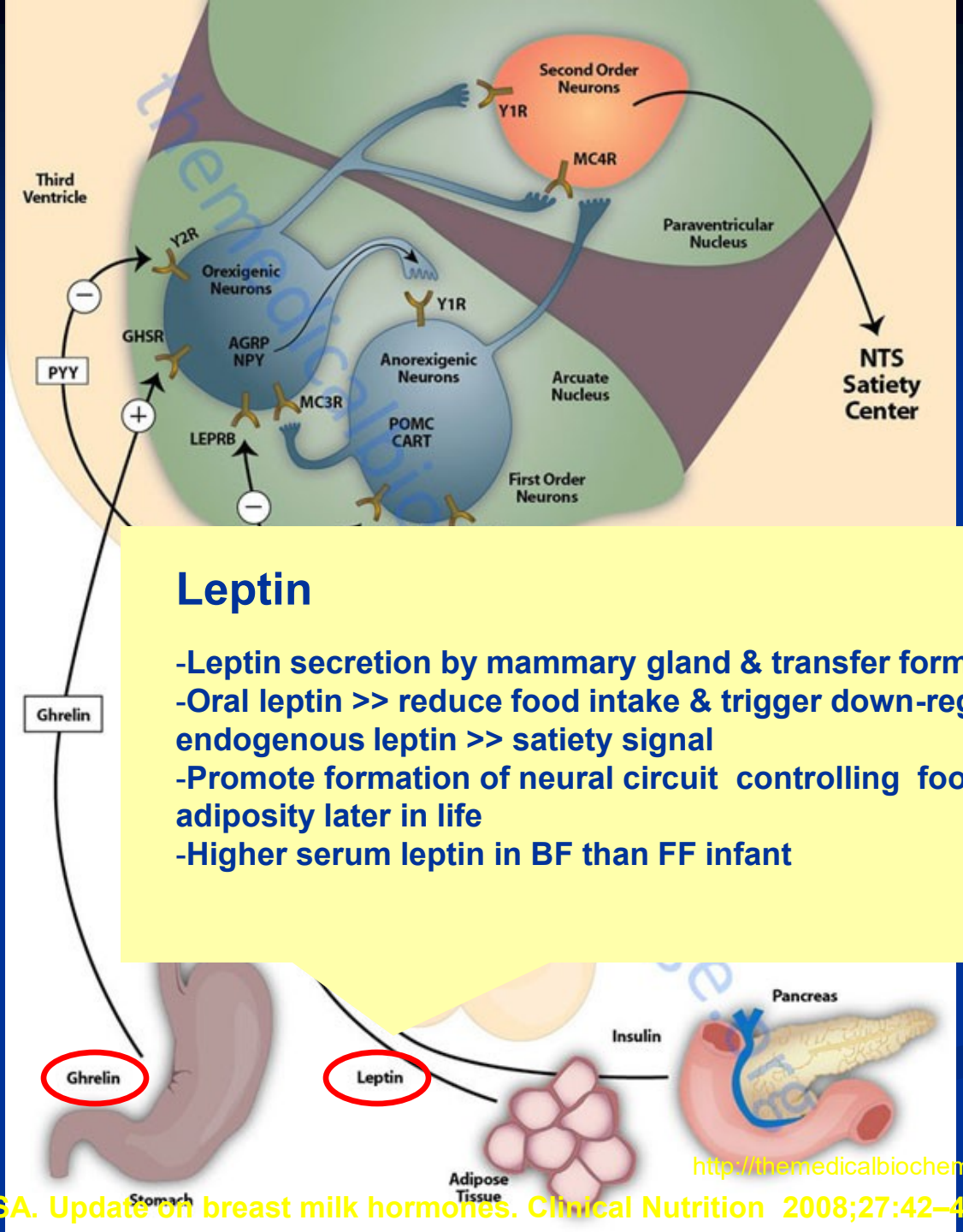
Modulating child behavior

- BF infant
  - Different suckling pattern
  - Higher suckling frequency
  - Greater degree of control on meal size & interval
- BM
  - Varies taste & smell >> programmed to different food selection & dietary habit in later life

Early growth and substrate supply

- BM
  - Lower average caloric density
  - Lower protein intake per kg bodyweight
- Slower growth rate in the 1st year


Second Order Neurons
Y1R
MC4R
Third Ventricle
Paraventricular Nucleus
Y2R
Orexigenic Neurons
Y1R
GHSR
AGRP NPY
Anorexigenic Neurons
Arcuate Nucleus
PYY
MC3R
NTS Satiety Center
LEPRB
POMC CART
First Order Neurons
LEPRB
Insulin Receptor
Ghrelin
Leptin Insulin
PYY
Small Intestine
Pituitary
Pancreas
Insulin
Ghrelin
Leptin
Adipose Tissue
Stomach
http://themedicalbiochemistrypage.org/gut-brain.php

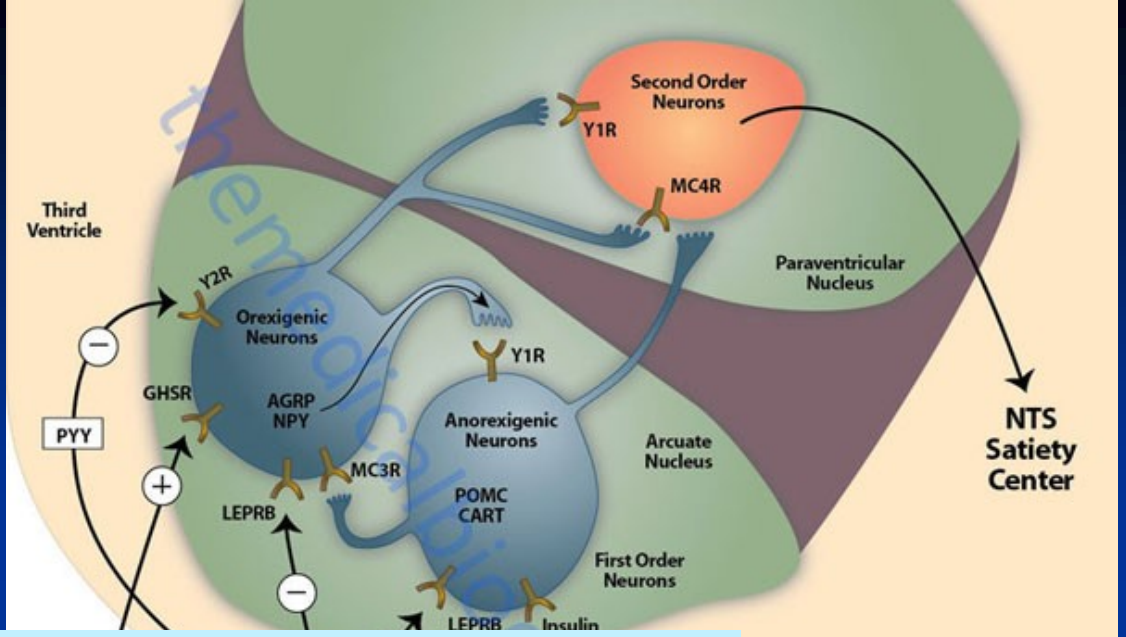


Leptin

-Leptin secretion by mammary gland & transfer form blood
-Oral leptin >> reduce food intake & trigger down-regulation of endogenous leptin >> satiety signal
-Promote formation of neural circuit controlling food intake & adiposity later in life
-Higher serum leptin in BF than FF infant

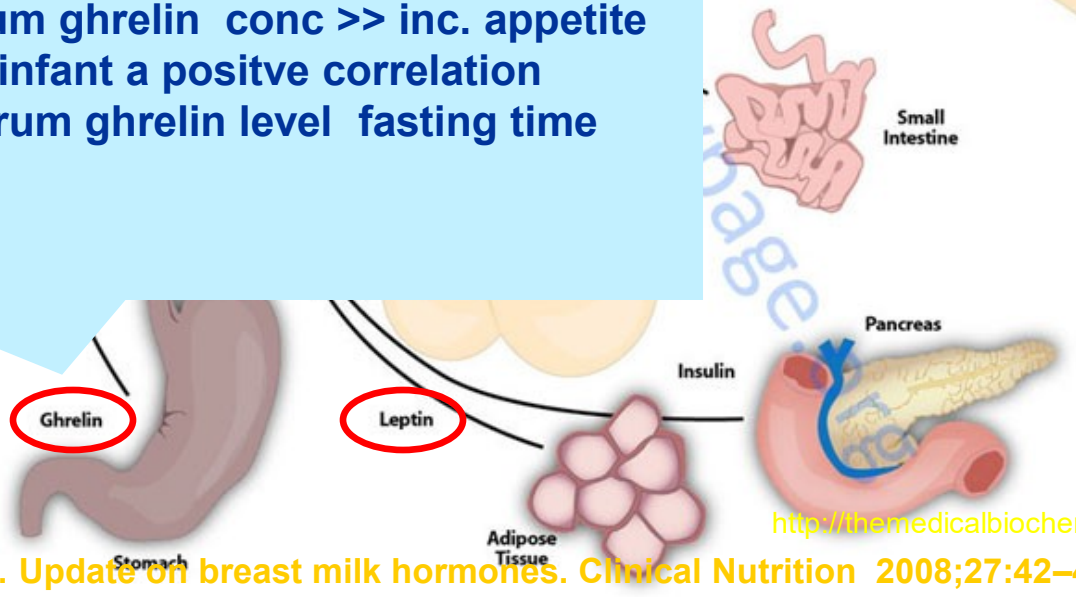
http://themedicalbiochemistrypage.org/gut-brain.php

Savino F and Liguori SA. Update on breast milk hormones. Clinical Nutrition 2008;27:42–47.



Ghrelin

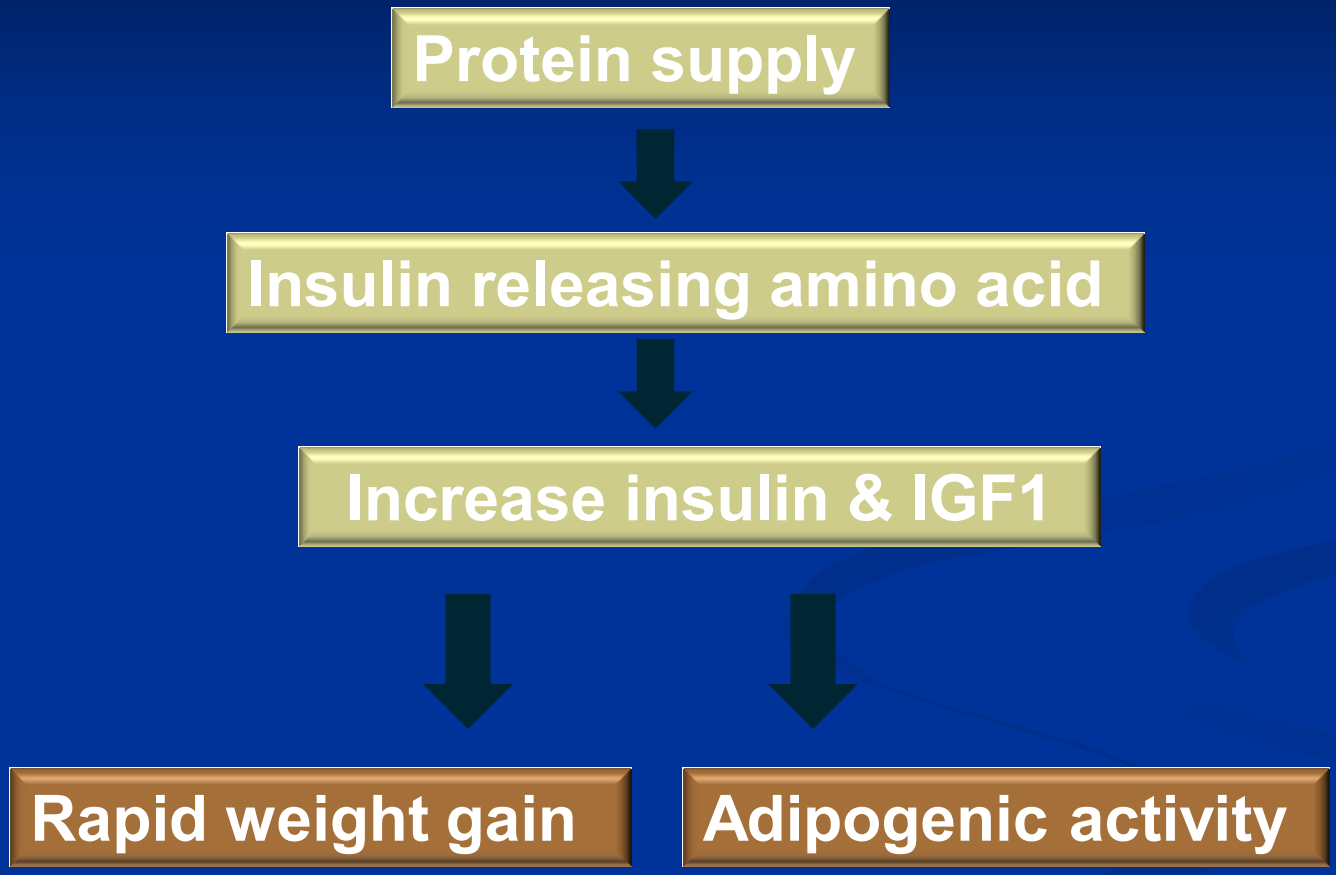
-Influence on growth in first months of life
- Higher seum ghrelin conc >> inc. appetite
-Only in FF infant a positve correlation between serum ghrelin level fasting time emerged



http://themedicalbiochemistrypage.org/gut-brain.php

Savino F and Liguori SA. Update on breast milk hormones. Clinical Nutrition 2008;27:42–47.

Early protein intake and later obesity risk



Berthold Koletzko. Am J Clin Nutr 2009;89(suppl):1502S–8S.

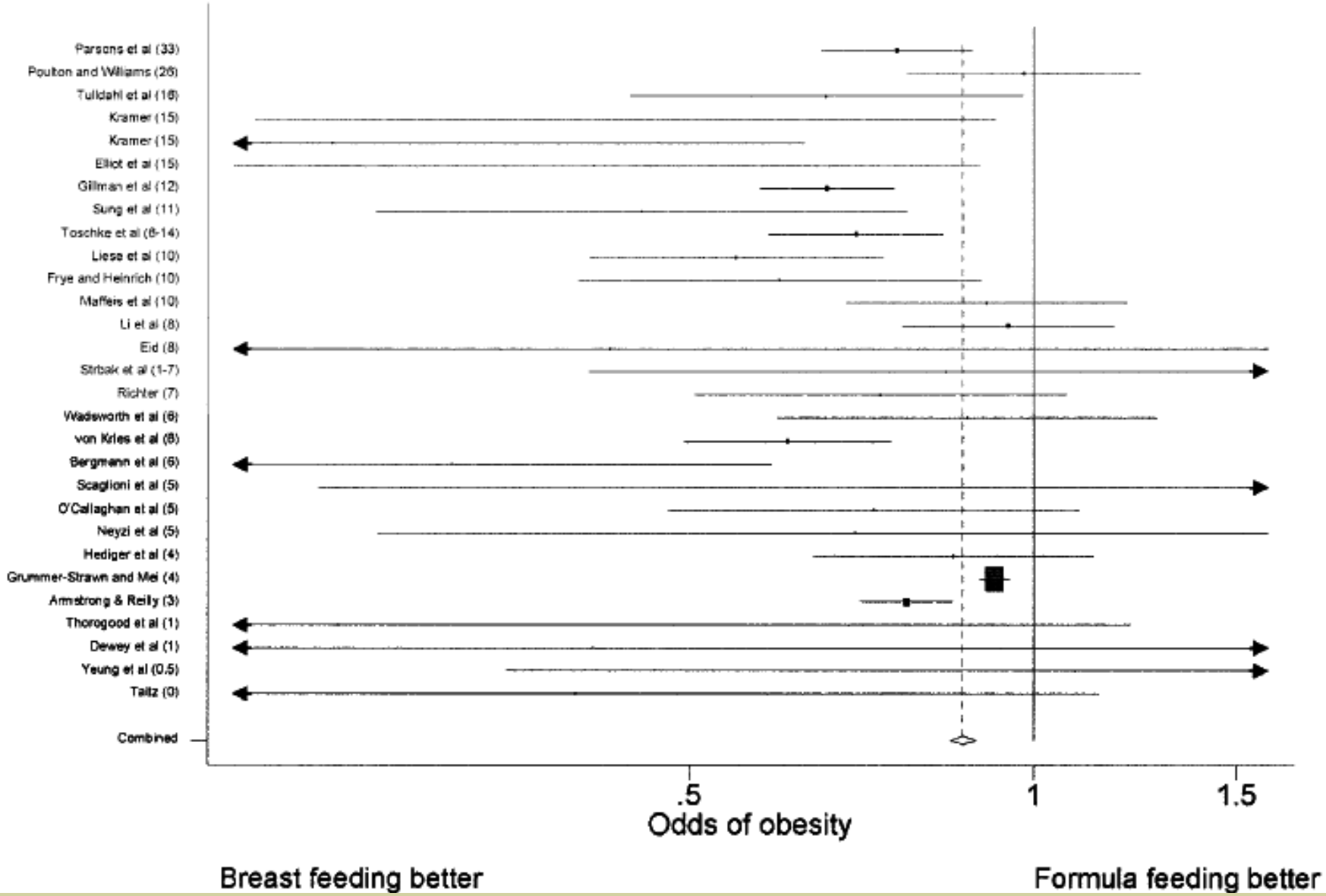
Effect of Infant Feeding on the Risk of Obesity Across the Life Course: A Quantitative Review of Published Evidence

Christopher G. Owen, Richard M. Martin, Peter H. Whincup, George Davey Smith and Derek G. Cook

Pediatrics 2005;115;1367
DOI: 10.1542/peds.2004-1176

- **Objective**
  - To examine the influence of initial infant feeding on obesity in later life
- **Methods**
  - A systematic review of published studies investigating the association between infant feeding and a measure of obesity was performed with Medline (1966 onward) and Embase (1980 onward) databases
- **Results**
  - Sixty-one studies reported on the relationship of infant feeding to a measure of obesity in later life
  - of these, 28 (298 900 subjects) provided odds ratio estimates

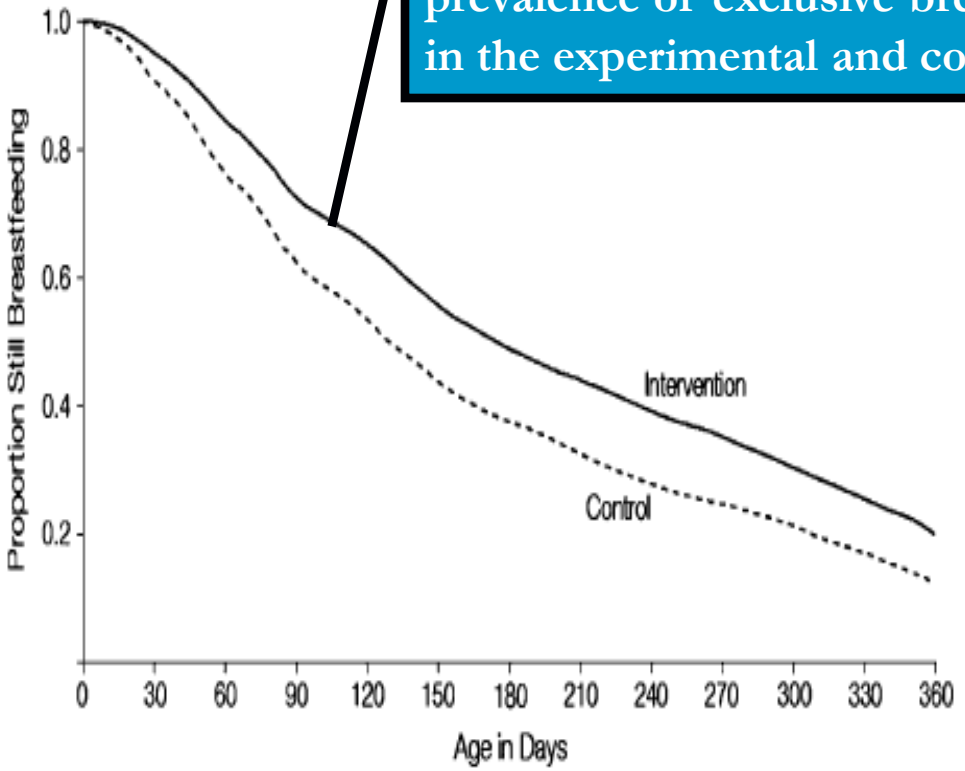
Christopher G, Derek G. Cook, et al. Effect of Infant Feeding on the Risk of Obesity Across the Life Course: A Quantitative Review of Published Evidence. *Pediatrics 2005;115;1367-1377.*



breastfeeding was associated with a reduced risk of obesity, compared with formula feeding (odds ratio: 0.87; 95% confidence interval [CI]: 0.85– 0.89) WHO 2013 review OR 0.88 (0.83-0.93)

A Randomized Breast-feeding Promotion Intervention Did Not Reduce Child Obesity in Belarus[1–3]

prevalence of exclusive breastfeeding
in the experimental and control group at 3 mo =43.3% vs 6.4%)



Michael S. Kramer, Stanley Shapiro,et al. J. Nutr. 2009;139: 417S–421S.

TABLE 2 Cluster-adjusted differences in anthropometry and BP results[1]

Outcome	Experimental	Control	Difference (95% CI)
Height, *cm*	121.1	120.2	+0.7 (−0.3, +1.7)
BMI, *kg/m²*	15.6	15.6	+0.1 (−0.2, +0.3)
Waist circumference, *cm*	54.6	54.2	+0.3 (−0.8, +1.4)
Triceps SF, *mm*	9.9	10.0	−0.4 (−1.8, +1.0)
Subscapular SF, *mm*	5.9	5.8	0.0 (−0.4, +0.5)
Systolic BP, *mm*	97.8	96.7	+0.2 (−2.9, +3.3)
Diastolic BP, *mm*	57.3	57.8	+0.2 (−1.8, +2.2)

[1] Adapted from Kramer et al. (1). Reprinted with permission from the American Society for Nutrition.

Conclusion :

we found no effect of prolonged and exclusive breast-feeding on height, adiposity, or BP in Belarusian early school-age children

Probably too young to see the effects on body fat accumulation !

Michael S. Kramer, Stanley Shapiro,et al. J. Nutr. 2009;139: 417S–421S.

Take home message !

- Breast-fed baby with adequate lactation support have 'ideal growth' *not* too small or too fat (!)
- Good complementary feeding *is essential* after 6 months to address some problem nutrients e.g. iron
- Long-term growth outcomes e.g. obesity prevention is not clear → still need long-term prospective follow-up studies
- Don't forget other health benefits of BF esp. cognitive and immune function

Thank you for your kind attention!