NUTRISI PERI KONSEPSI UNTUK 1000 HARI PERTAMA KEHIDUPAN

Maisuri T. Chalid
Department of Obstetrics and Gynecology, Faculty of Medicine
Hasanuddin University


270 days
of Pregnancy
+
365 days
of 1st year
+
365 days
of 2nd year
+
=
First
1000 days
1000 HPK

MENGAPA 1000 HARI PERTAMA KEHIDUPAN, PENTING?

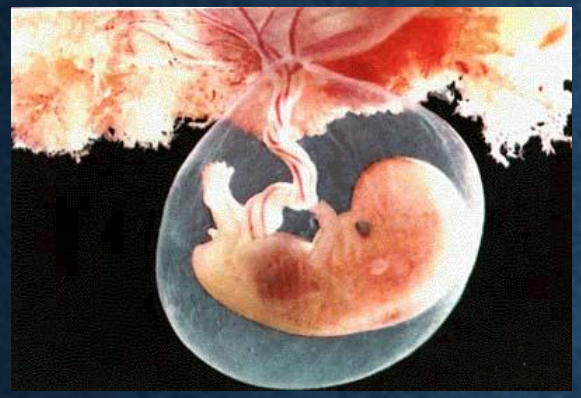
Sumber: Short and long term effects of early nutrition (James et al 2000)

Fetal Origins of Adult Disease:

“Barker” hypothesis: programming of function

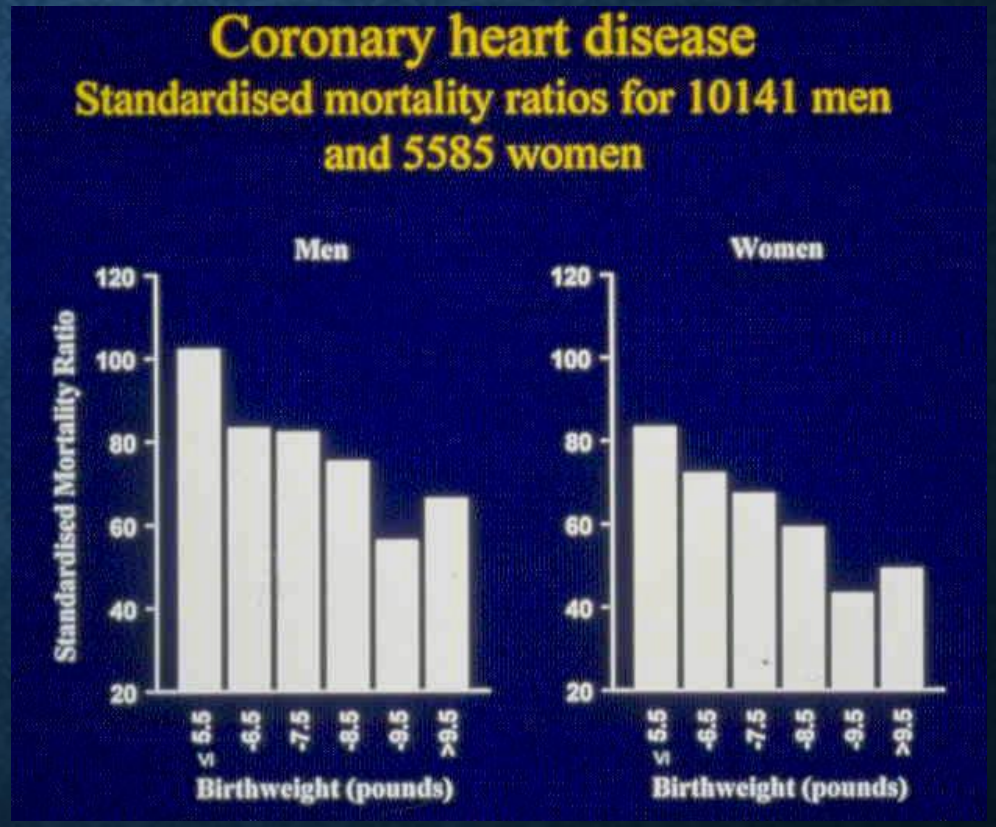
During early life nutrient exposure sets metabolic behaviour and thereby determines the risk of chronic disease during adult life.

Early Life Origins of Health and Disease



Evidence of a relationship between birth weight and risk of non-communicable disease in adult life:

- **Type II diabetes**
- **Hypertension**
- **CVD**
- **Obesity**
- **Other …….**

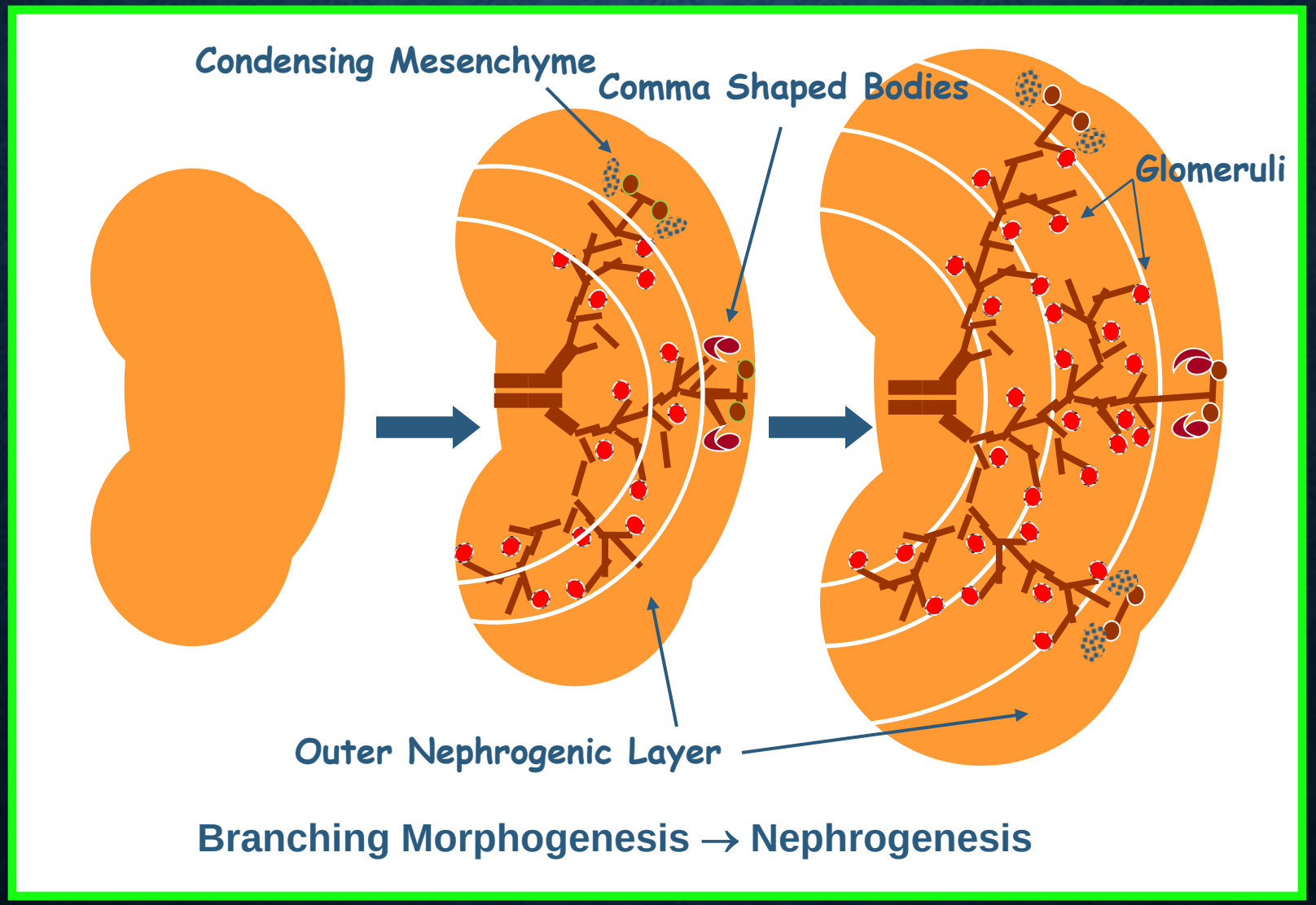


Potential Mechanisms of Developmental Programming

Structural Deficits → Reduced Functional Units in Organs

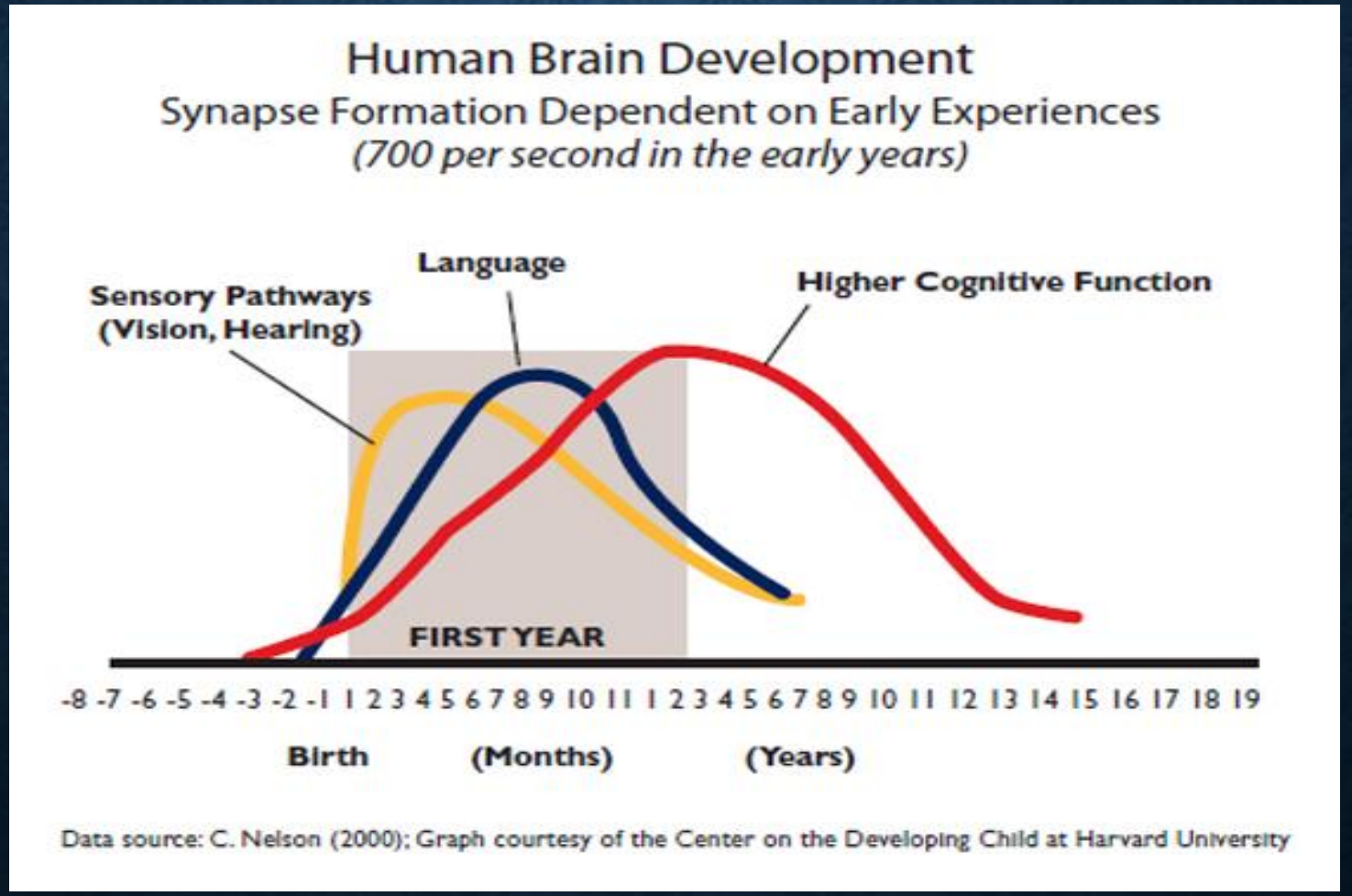
Kidney	↓ Nephron #	HTN
Pancreas	↓ Islet Cell #	Δ Insulin secretion ↑ Glucose
Muscle	↓ muscle mass	↓ Basal met rate ↓ Exercise capacity
Heart	↓ myocyte #	↑ Risk CHF
Liver	↓ cells #	? Δ lipid metabolism

New Nephrons Form in Concentric Layers during Gestation

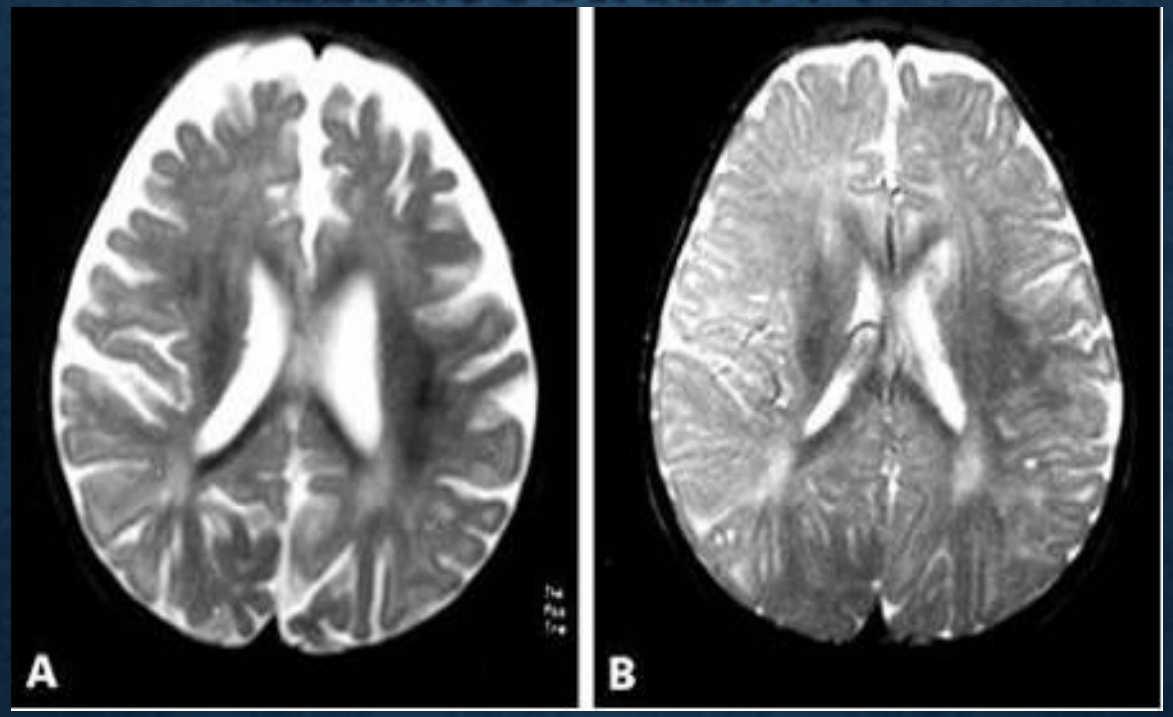


Branching Morphogenesis → Nephrogenesis

PERTUMBUHAN OTAK PADA PERIODE 1000 HARI PERTAMA KEHIDUPAN



APA DAMPAK KEKURANGAN GIZI KRONIS DALAM 1000 HARI PERTAMA KEHIDUPAN TERHADAP PERKEMBANGAN OTAK SELANJUTNYA ???



Gambar A menunjukkan otak anak yang mengalami kekurangan gizi kronis dalam 1000 hari kehidupannya dan gambar B menunjukkan otak dengan gizi baik (sehat). Pada otak anak yang sehat hampir tidak ada bagian yang kosong (putih) dan terlihat padat dan banyak lekukan, karena otak berkembang dengan baik. Sedangkan pada gambar A terlihat banyak bagian kosong (putih) dan lekukannya sedikit, karena otak tidak berkembang secara optimal. Kerusakan dan keterlambatan perkembangan otak bersifat menetap sehingga anak tidak bisa mencapai tumbuh kembang yang optimal.


Environment Special:
The oceans—why 70% of our planet is in danger
The Facebook Movie:
The secret history of social networking
TIME
How the first nine months shape the rest of your life
The new science of fetal origins
BY ANNIE MURPHY PAUL

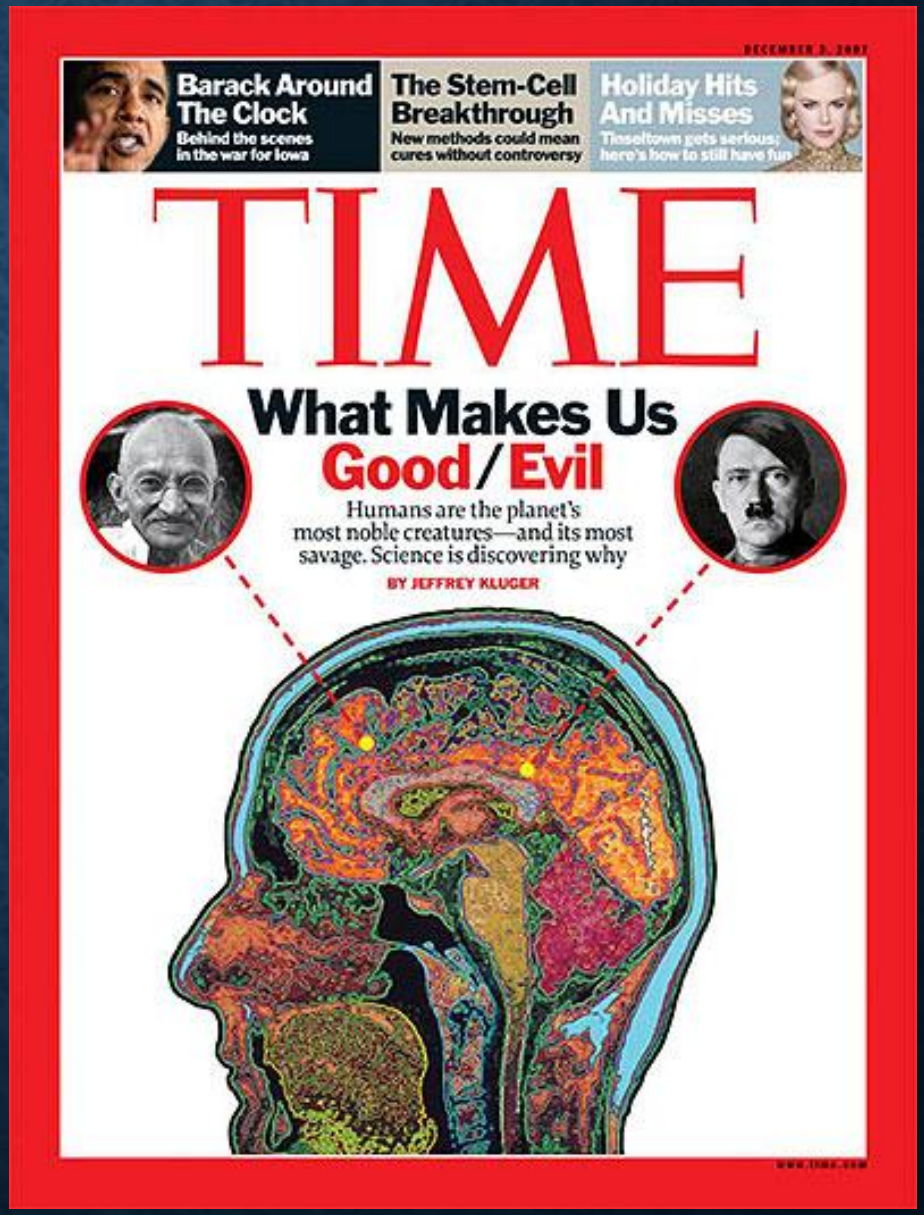
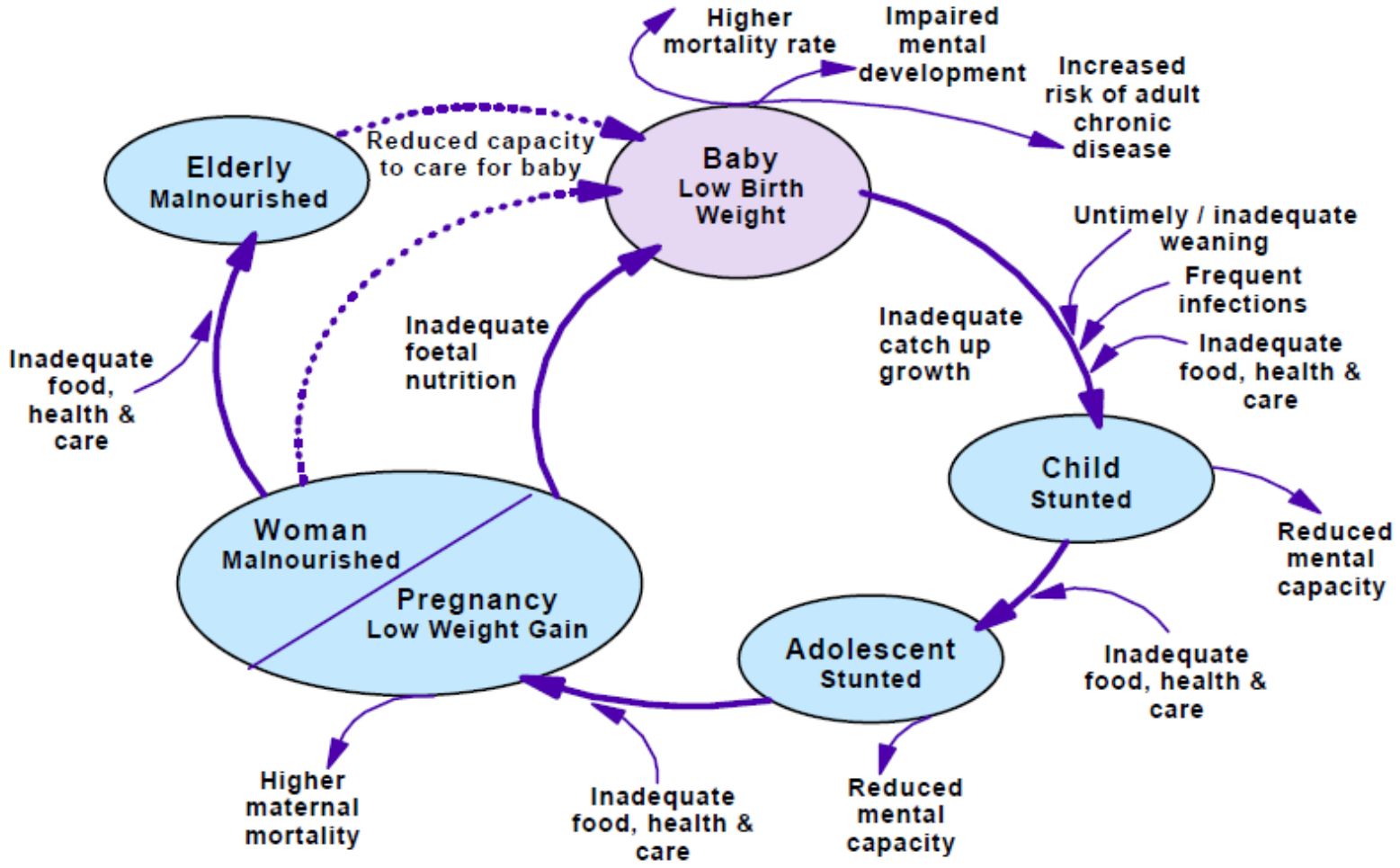

Barack Around The Clock
Behind the scenes in the war for Iowa
The Stem-Cell Breakthrough
New methods could mean cures without controversy
Holiday Hits And Misses
Tinseltown gets serious; here's how to still have fun
TIME
What Makes Us Good/Evil
Humans are the planet's most noble creatures—and its most savage. Science is discovering why
BY JEFFREY KLUGER

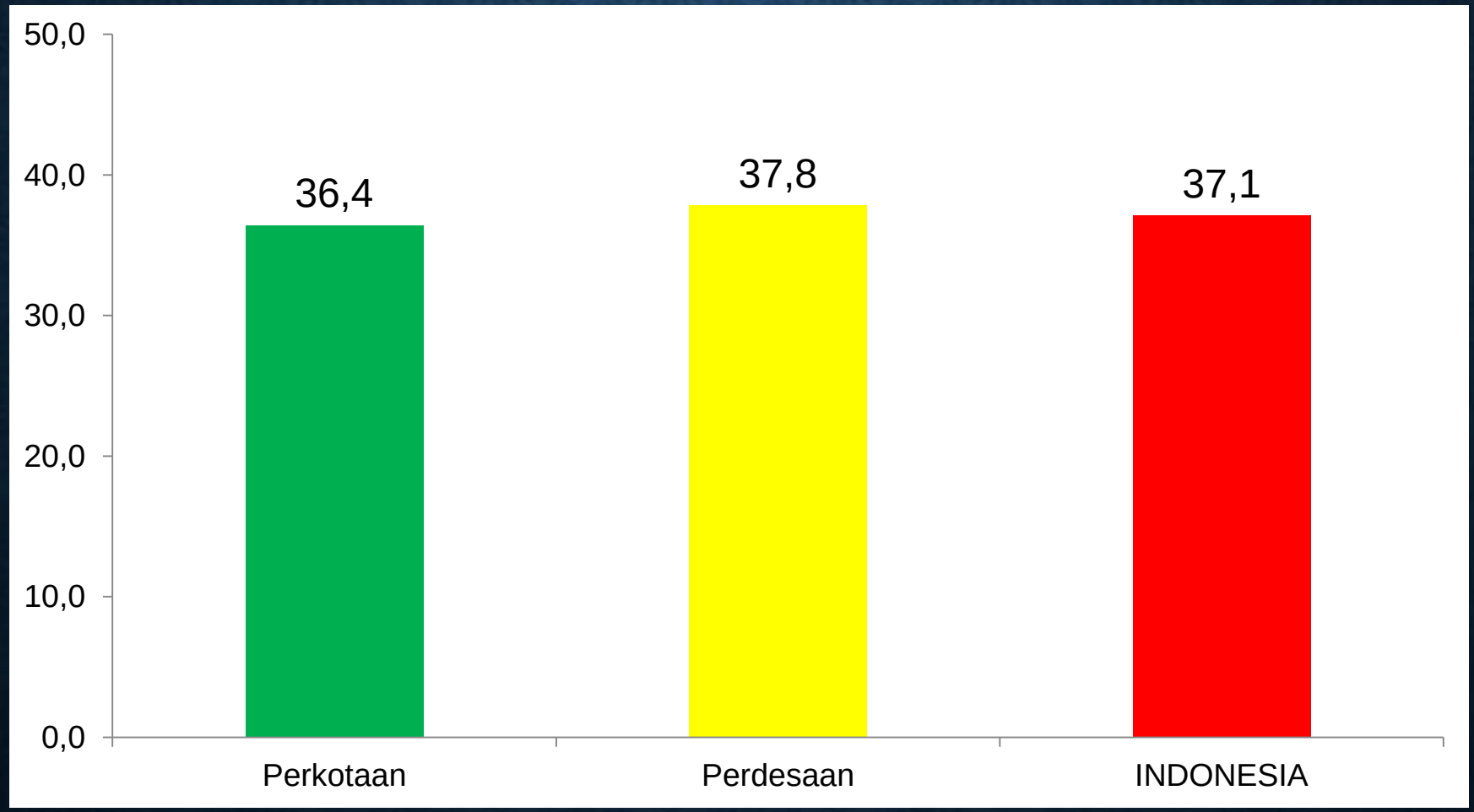
Figure 1. Nutrition throughout the lifecycle



Source: Commission on the Nutrition Challenges of the 21st Century (2000) Final report to the ACC/SCN.

STATUS OF INDONESIAN PREGNANT WOMEN?

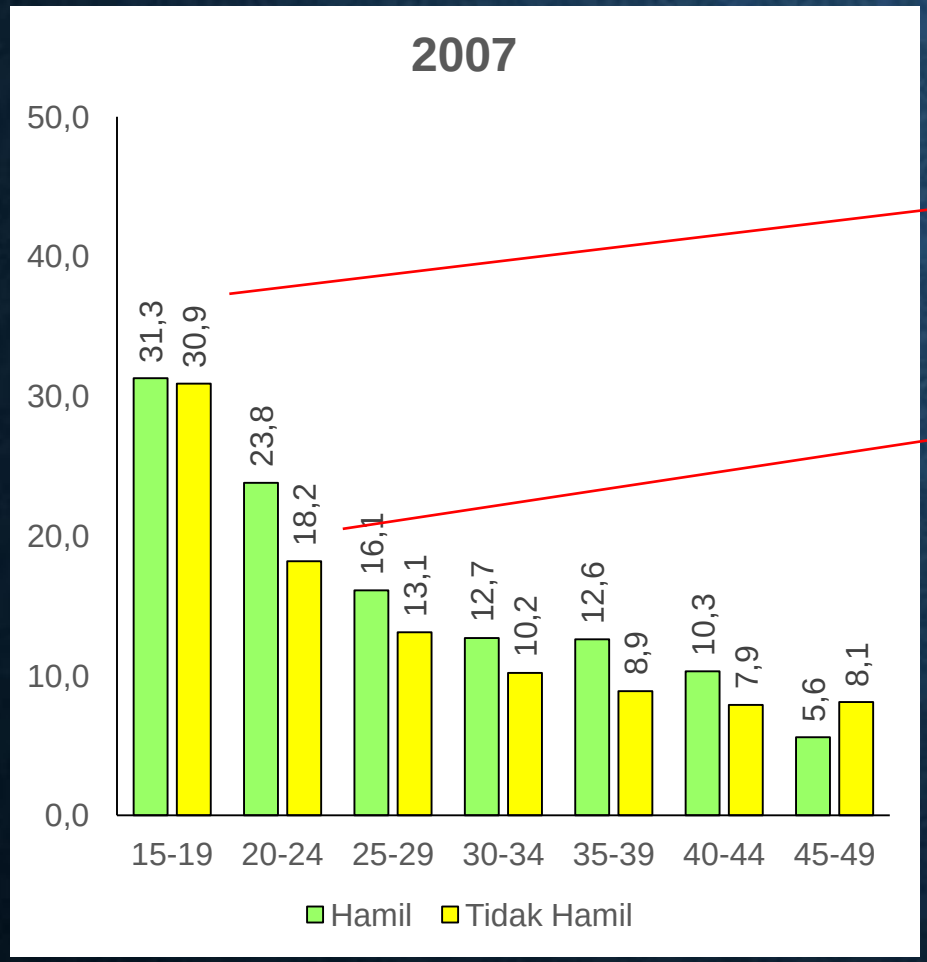
PROPORTION OF ANEMIA IN PREGNANT WOMEN VS URBAN/RURAL AREA, 2013

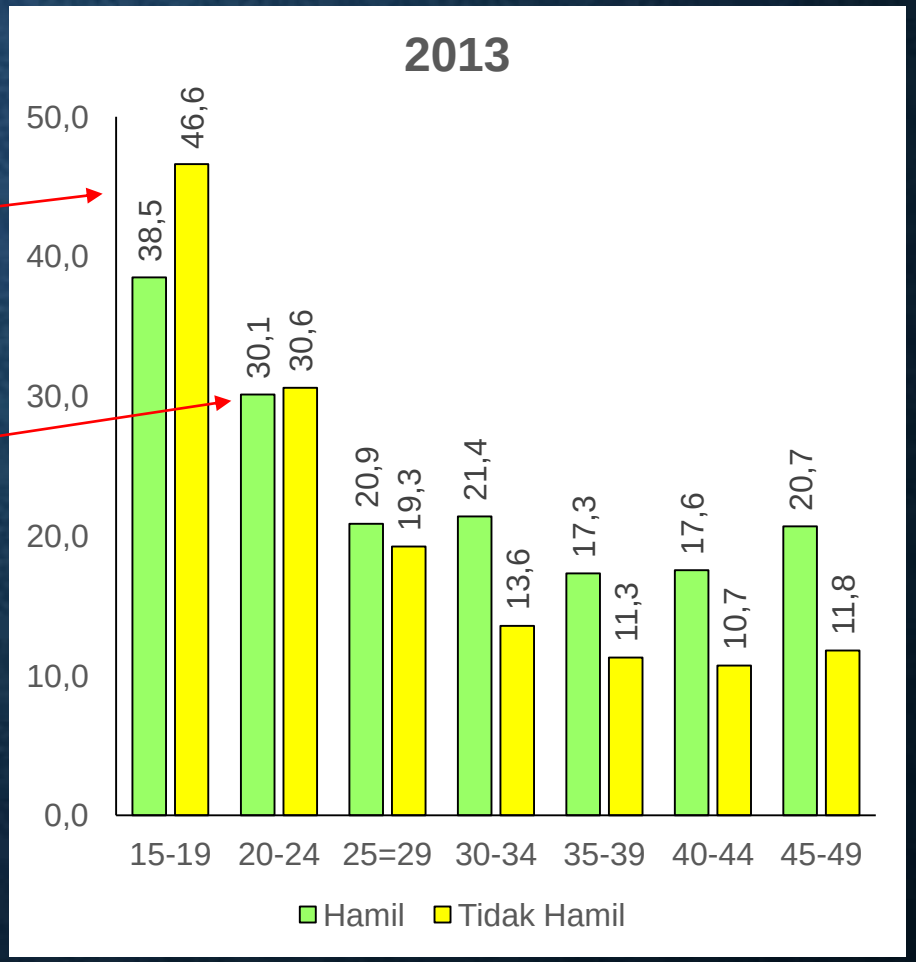


*) Nilai rujukan menurut WHO/MNH/NHD/MNN/11.1,2011 dan Kemenkes,1999

**) C*ut off* points anemia Ibu Hamil, Hb < 11,0 g/dl

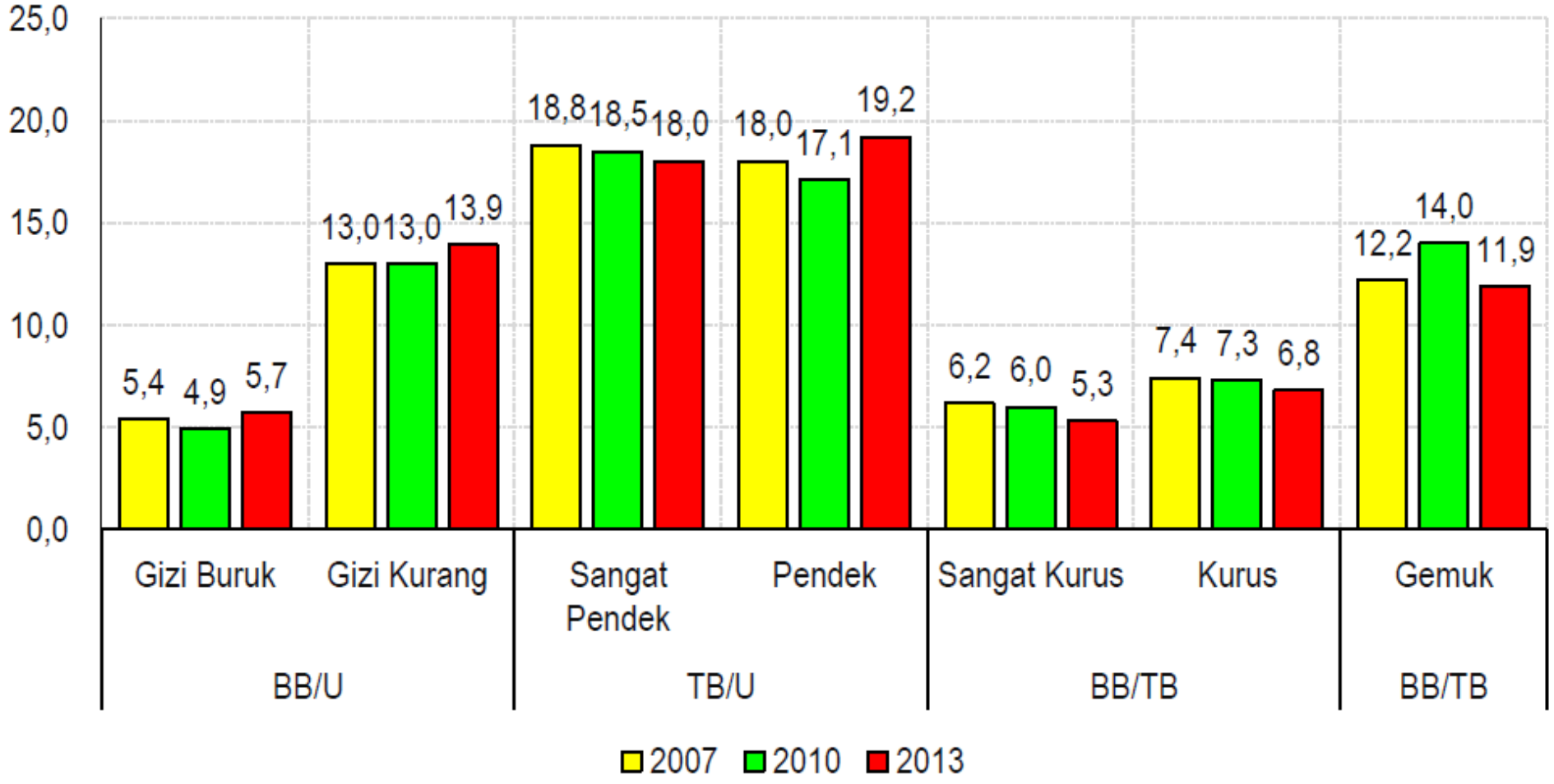
PROPORTION OF WOMEN REPRODUCTIVE AGE WITH CHRONIC ENERGY MALNUTRITION: 2007 & 2013





*) Risiko KEK – jika Lingkar lengan atas (LILA)<23,5 cm

Source: Riskesdas 2007, 2013



Gambar 3.14.4
Kecenderungan prevalensi gizi kurang, pendek, kurus, dan gemuk pada balita, Indonesia 2007,2010, dan 2013

AGE GROUPS VS ENERGY CONSUMPTION, 2014

Karakteristik	Tingkat kecukupan kalori			
	< 70% AKK	70-<100 % AKK	≥100-<130% AKK	≥130% AKK
0-59 bln	6,8	48,9	27,1	17,1
5-12 thn	29,7	40,1	19,9	10,2
13 – 18 thn	52,5	30,3	12,2	5,0
19 – 55 thn	50,0	32,5	12,9	4,6
>55 thn	44,6	33,5	15,5	6,3

Sumber: Studi Diet Total 2014

AGE GROUPS VS PROTEIN CONSUMPTION, 2014

Karakteristik	Tingkat kecukupan protein			
	< 80% AKP	80%-<100% AKP	≥100-<120% AKP	≥120% AKP
Kelompok Umur				
0 - 59 bln	23,6	10,6	11,5	54,2
5 - 12 thn	29,3	16,1	14,7	39,9
13-18 thn	48,1	18,1	13,4	20,1
19-55 thn	33,8	17,9	15,1	33,3
>55 thn	45,8	17,4	13,1	23,7

Source: Studi Diet Total 2014

POTENSI INDONESIA

Tabel 4.8. Negara Produsen Telur di Dunia , 2005

Rank	Commodity	Production	
		Value US $ 1000	Volume (MT)
1	China	3,970,835	4,326,140
2	Thailand	286,270	310,000
3	Indonesia	166,470	180,270
4	Philippines	66,488	72,000
5	Brazil	54,945	59,500
6	Romania	32,875	35,600
7	Korea, Republic of	25,857	28,000
8	Bangladesh	24,010	26,000
9	United Kingdom	14,775	16,000
10	Myanmar	13,113	14,200
11	Russian Federation	12,005	13,000
12	Malaysia	10,158	11,000
13	Ukraine	7,534	8,158
14	Pakistan	6,649	7,200
15	Madagascar	4,189	4,536
16	Slovakia	4,156	4,500
17	Hungary	3,878	4,200
18	Cambodia	3,463	3,750
19	New Zealand	2,309	2,500
20	Bulgaria	1,847	2,000

Sumber : FAO, 2007

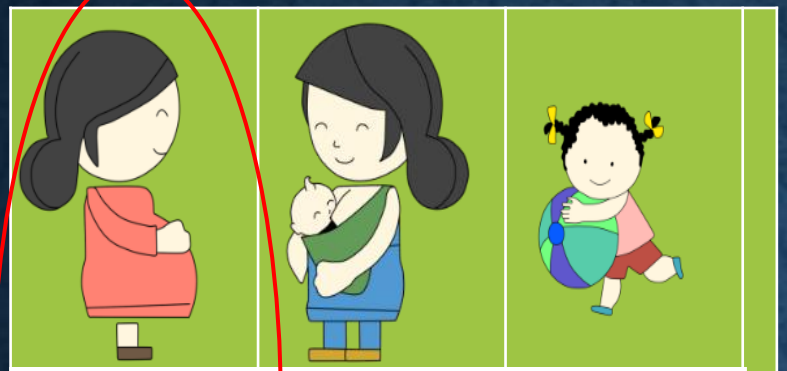
TABEL 1

PERBANDINGAN LUAS LAUT, PANJANG PANTAI, PRODUKSI, EKSPOR DAN IMPOR HASIL PERIKANAN DI 7 NEGARA

NO	NEGARA	LUAS LAUT + ZEE (KM^2)	PANJANG PANTAI (KM)	PRODUKSI 2012 (TON)	EKSPOR 2013 (US$ 000)	IMPOR 2013 (US$ 000)
1	China	2.287.969	30.017	70.368.028	20.336.173	8.564.044
2	Thailand	299.397	7.066	3.068.450	7.153.102	**3.452.275**
3	Vietnam	417.663	11.409	5.942.300	5.728.260	3.441.725
4	**Indonesia**	**6.159.032**	**95.181**	**15.504.747**	**4.181.858**	**461.957**
5	Filipina	1.590.780	33.900	4.868.649	1.502.793	406.482
6	Australia	8.505.348	66.530	239.596	1.325.475	1.792.379
7	Malaysia	334.671	9.323	2.096.631	810.290	1.112.076

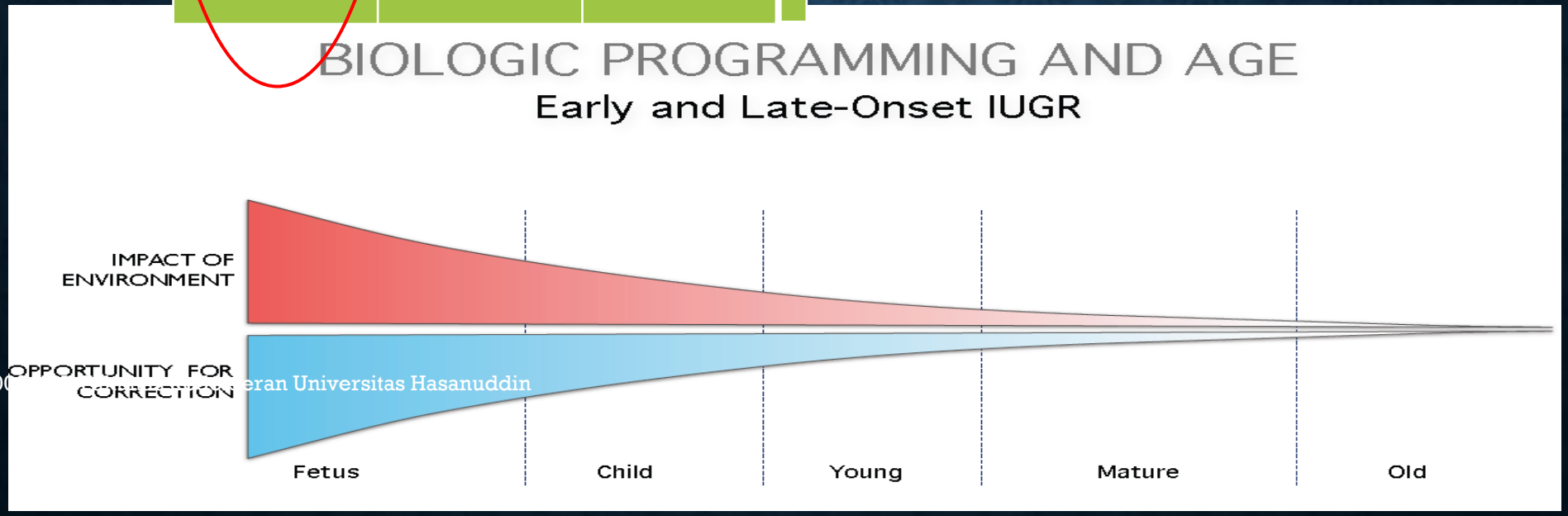
Sumber : Hutagalung (2014)

Pada 2010 sumbangan protein ikan dalam total asupan protein hewani rakyat Indonesia baru 50 %, sekarang 62 %.

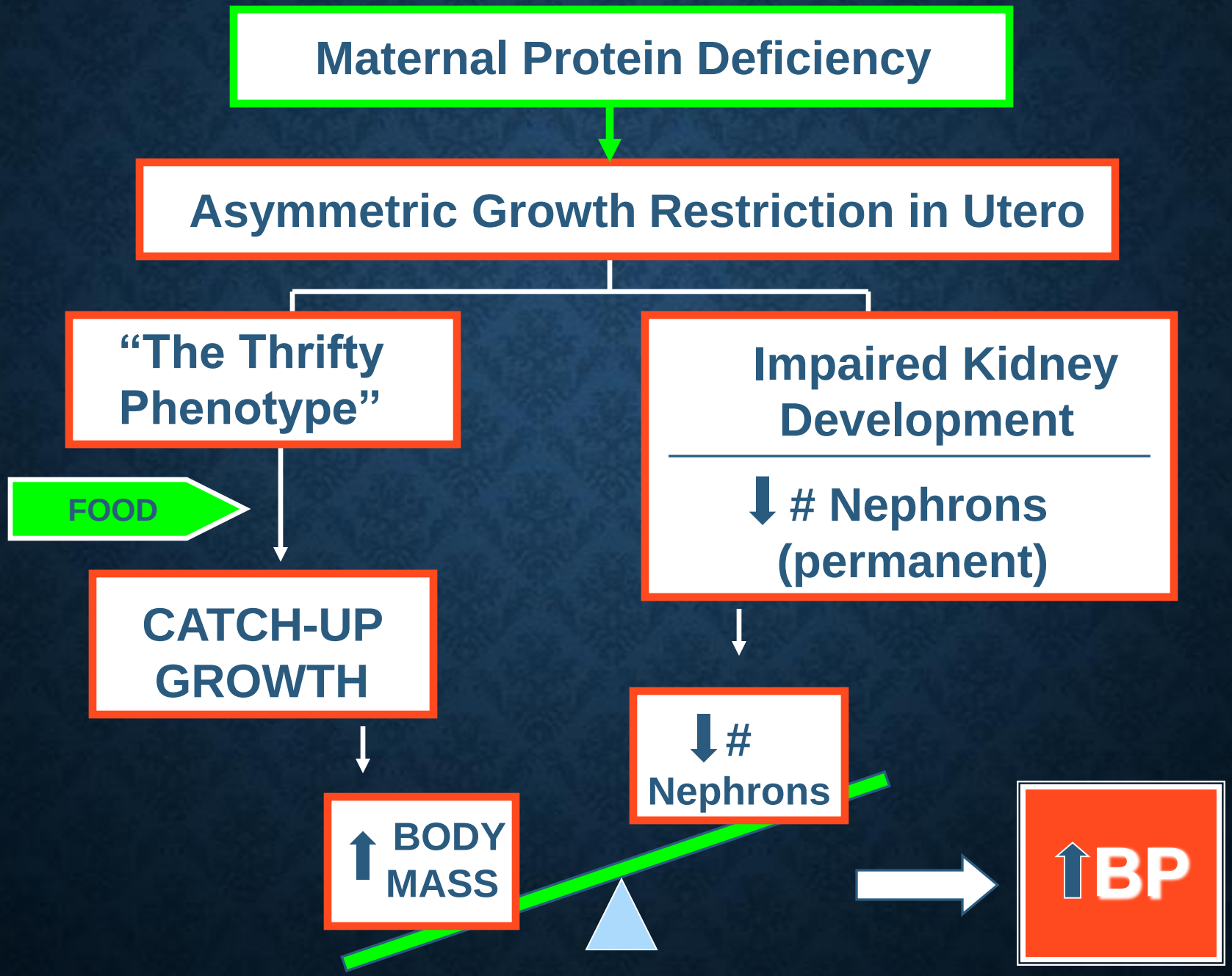


Sembilan bulan dalam rahim (9x30 hari) = 270 hari	Tahun I kelahiran (365 hari)	Tahun II kelahiran (365 hari)

WINDOW OF OPPORTUNITY



The fetal supply line. Multiple factors at each step along the supply line will determine the ultimate effect of any change in maternal nutrition on fetal nutrition and hence on fetal growth


Maternal Protein Deficiency
Asymmetric Growth Restriction in Utero
"The Thrifty Phenotype"
FOOD
CATCH-UP GROWTH
↑ BODY MASS
Impaired Kidney Development
↓ # Nephrons (permanent)
↓ # Nephrons
↑BP

Maternal & Child Nutrition

DOI: 10.1111/mcn.12183

Review Article

The effect of balanced protein energy supplementation in undernourished pregnant women and child physical growth in low- and middle-income countries: a systematic review and meta-analysis

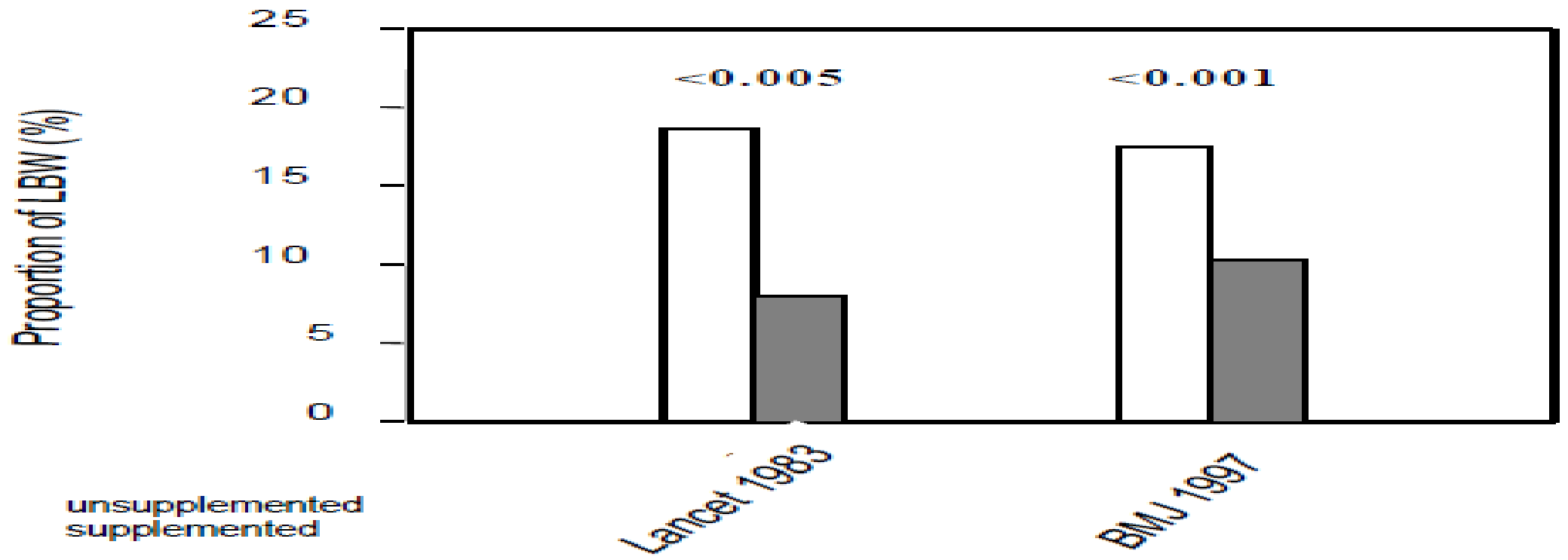
Briony Stevens*, Petra Buettner*, Kerrianne Watt*, Alan Clough,*§ Julie Brimblecombe¶ and Jenni Judd*†‡

*School of Public Health, Tropical Medicine and Rehabilitation Sciences, James Cook University, Townsville, Queensland, Australia, §Australian Institute of Tropical Health and Medicine, Townsville, Queensland, Australia, ¶Menzies School of Health Research, Darwin, Northern Territory, Australia, †Anton Breinl Centre for Health Systems Strengthening, James Cook University, Townsville, Queensland, Australia and ‡School of Public Health and Social Work, Queensland University of Technology, Kelvin Grove, Queensland, Australia

Key messages

- First systematic review to-date that analyses the effect of balanced protein energy supplementation during pregnancy in undernourished women of low- and middle-income countries only.
- Between 1970 and 2015, seven unique studies measured the effect of balanced protein supplementation in undernourished pregnant women in low- and middle-income countries on child growth outcomes.
- In low- and middle-income countries, balanced protein energy supplementation has a statistically significant positive impact on the birthweight when the mother is undernourished.
- The impact of balanced protein energy supplementation for undernourished pregnant women on subsequent child growth in low- and middle-income countries remains inconclusive, as the evidence in these studies is not sufficient to determine the effectiveness.

Figure 9. The effect of a high energy food supplement on proportion of LBW - the Gambia



Source: Cessay et al. (1997) *BMJ* 315:786; Prentice (1983) *Lancet* 1:489.

Bone Health

Thiamin
Riboflavin
Niacin
Pantotenic acid
Vit B12

Blood formation (and clotting)

Vit B6
Folate
Vit B12
Vit K

Energy metabolism

Thiamin
Riboflavin
Niacin
Pantothenic acid
Biotin
Vit B12

Protein Metabolism

Vit B6
Vit C
Folate

Gene Expression

Vit A
Vit D

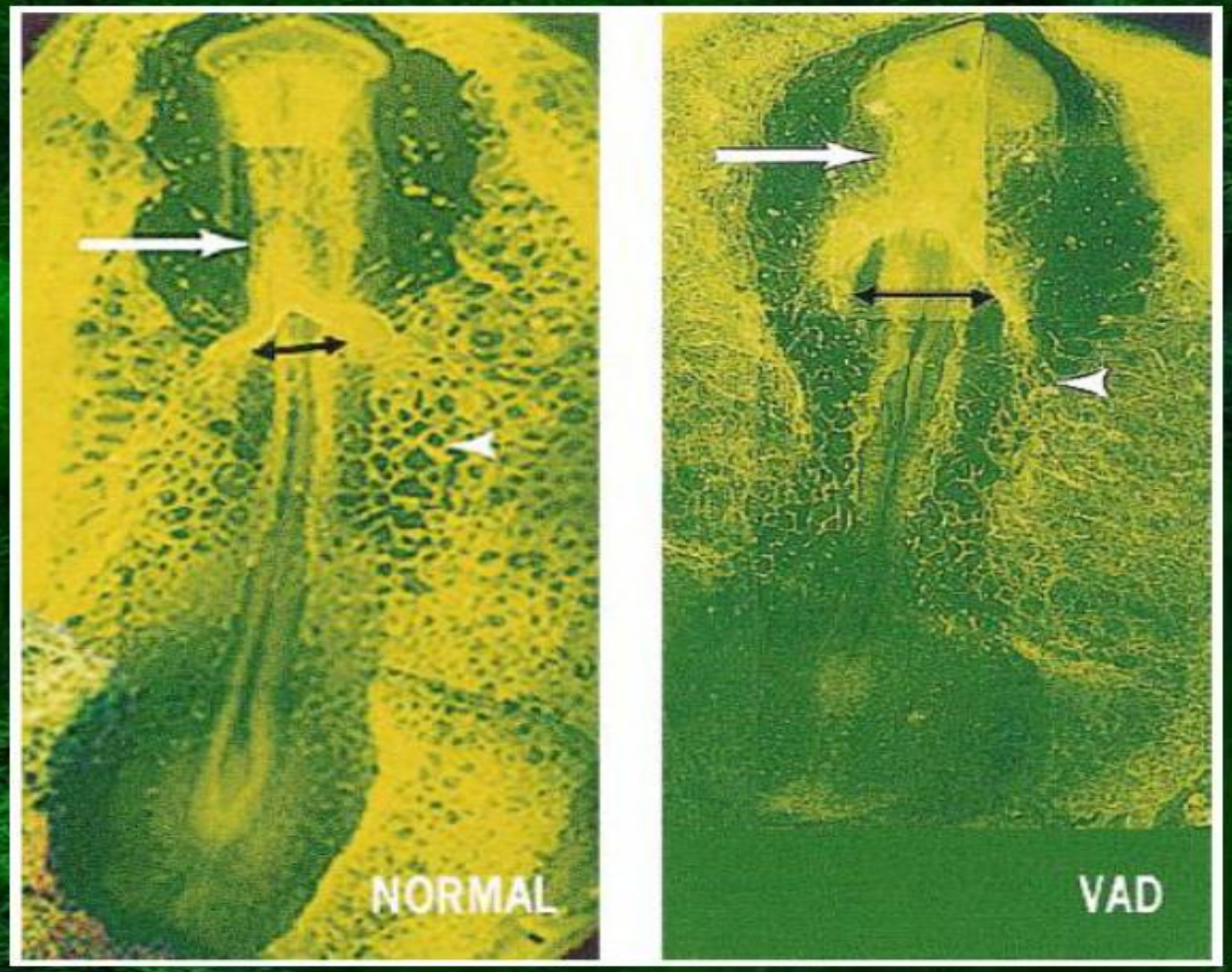
Antioxidant defences

Vit E
Carotenoids
Vit C
Lipoic acid
Riboflavin

Homocysteine metabolism

Vit B6
Folate
Vit B12
Choline
Riboflavin

Function of Vitamin A in Vertebrate Embryonic Development



Vascular development in the 36–38 h normal and vitamin A–deficient (VAD) quail embryo. In the normal embryo, well-formed vascular networks (arrowhead) converge into vitelline veins at the cardiac inflow tract (black arrows); the VAD embryo has sparse, disorganized vascular networks and poorly developed vitelline veins. Heart (large arrows) has begun to loop in the normal embryo but is abnormal in the VAD embryo. Note the distorted head and short body in the VAD embryo. All views are ventral.

J. Nutr. 2001;131: 705–708

Pengaruh Betacaroten terhadap Preeklampsia

Pengaruh β-karoten terhadap resiko preeklamsia

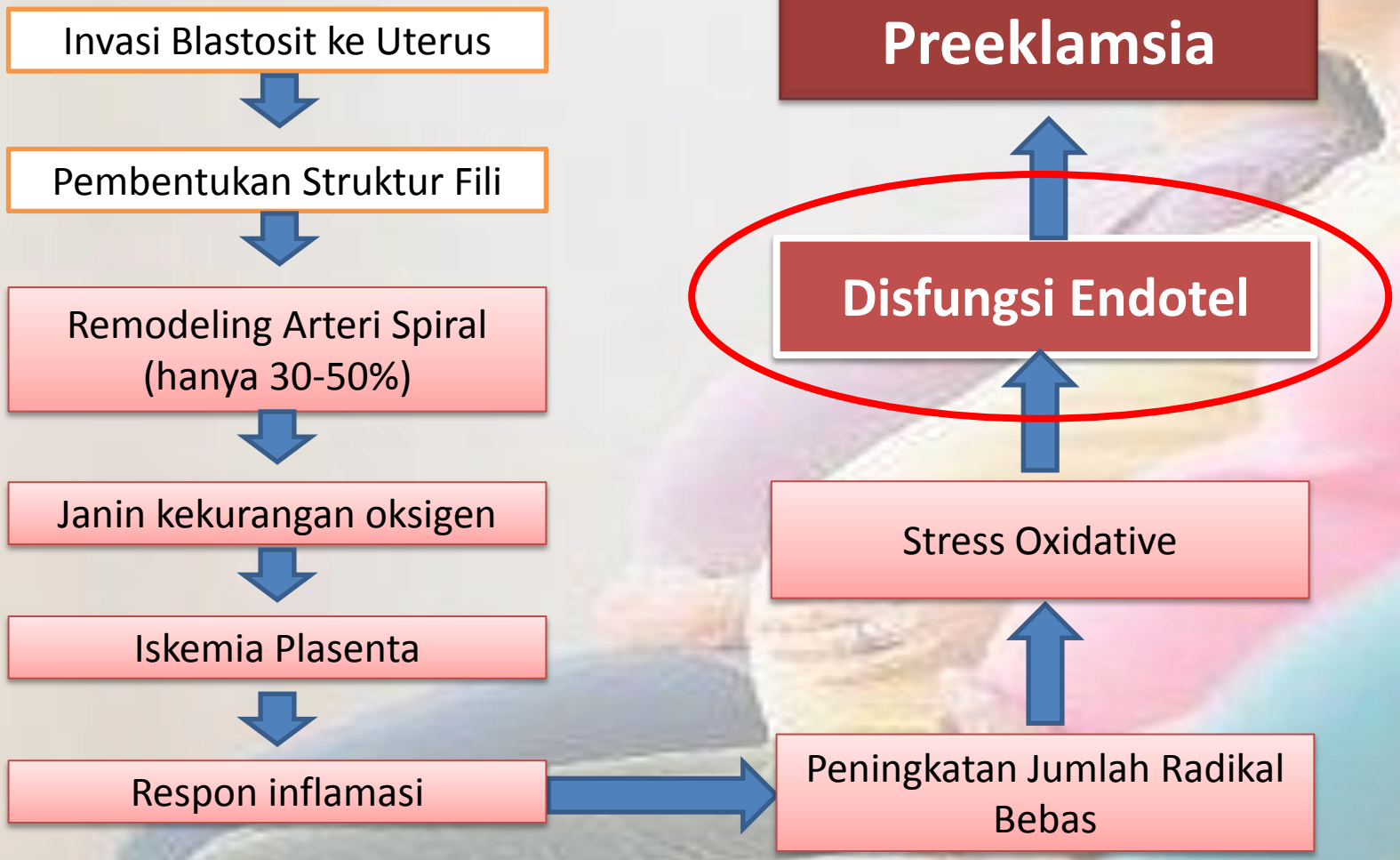
Terjadi penurunan resiko preeklamsia sebesar **38.18%** pada wanita dengan konsentrasi β-karoten di kuartil tertinggi dibandingkan dengan kuartil terrendah.[3]

MULTIPLE MICRONUTRIENT SUPPLEMENTATION

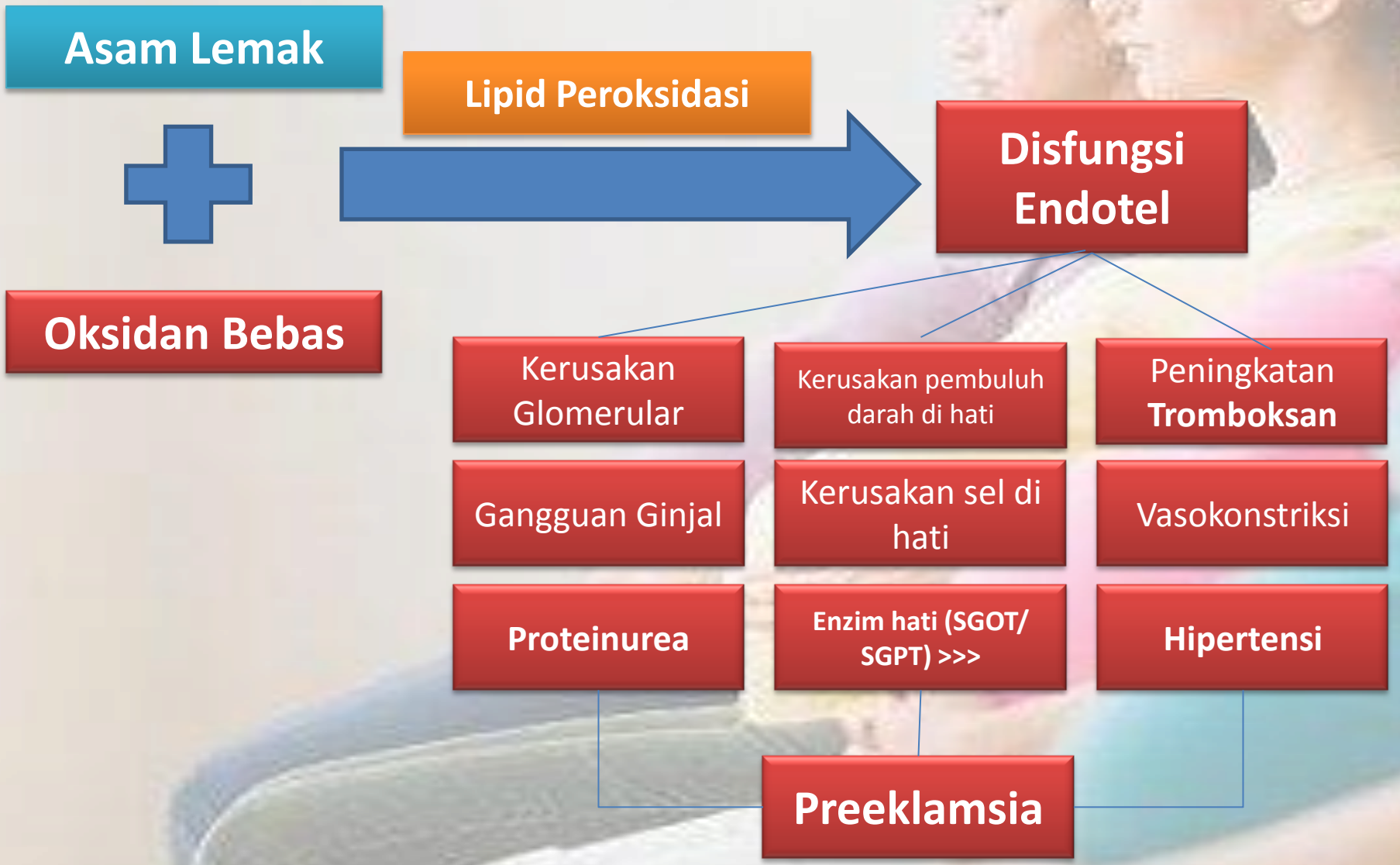
- Women of reproductive age, especially pregnant women, in developing countries are recognized to be at risk of multiple micronutrient deficiencies, such as iron, folic acid, iodine, zinc, vitamins A and D, riboflavin, B6 and B12, with the likelihood of adverse effects on the mother and pregnancy outcomes
- Pregnancy represents a state of increased metabolic requirements, and intake of key micronutrients by pregnant women especially in developing countries is usually inadequate. This inadequate intake and increased requirement further exacerbates the pre-existing maternal deficiency [7].

PERANAN IONIC CALCIUM, DHA & ANTIOKSIDAN PADA KASUS PRE EKLAMSIA

Teori Disfungsi Endotel



Disfungsi Endotel



Hubungan Antioksidan dan Preeklampsia pada Kehamilan

Oxidative stress markers and antioxidant levels in normal pregnancy and pre-eclampsia

Table 1 Circulating levels of oxidative stress markers in healthy pregnant women and pregnant women with pre-eclampsia[a]

Oxidative stress marker	Control group ($n=50$)	PE group			*P* value (control vs. overall PE)
		Overall PE group ($n=50$)	Mild PE ($n=41$)	Severe PE ($n=9$)	
GPX (U/L)	156.80 ± 27.18 (118–206)	309.36 ± 59.88 (210–467)	290.85 ± 43.05 (210–391)	393.67 ± 54.27 (302–467)	<0.001
SOD (U/mL)	199.94 ± 28.48 (158–260	332.74 ± 85.59 (203–528)	306.98 ± 67.65 (203–437)	450.11 ± 55.60 (370–526)	<0.001
MDA (nmol/mL)	2.35 ± 0.76 (1.09–4.02)	6.68 ± 1.75 (3.82–9.84)	6.49 ± 1.83 (3.82–9.84)	7.55 ± 0.97 (6.18–9.04)	<0.001

Abbreviations: GPX, glutathione peroxidase; MDA, malondialdehyde; PE, pre-eclampsia; SOD, superoxide dismutase.

[a] Values are given as mean ± SD (range) unless otherwise indicated.

Hubungan Antioksidan dan Preeklampsia pada Kehamilan

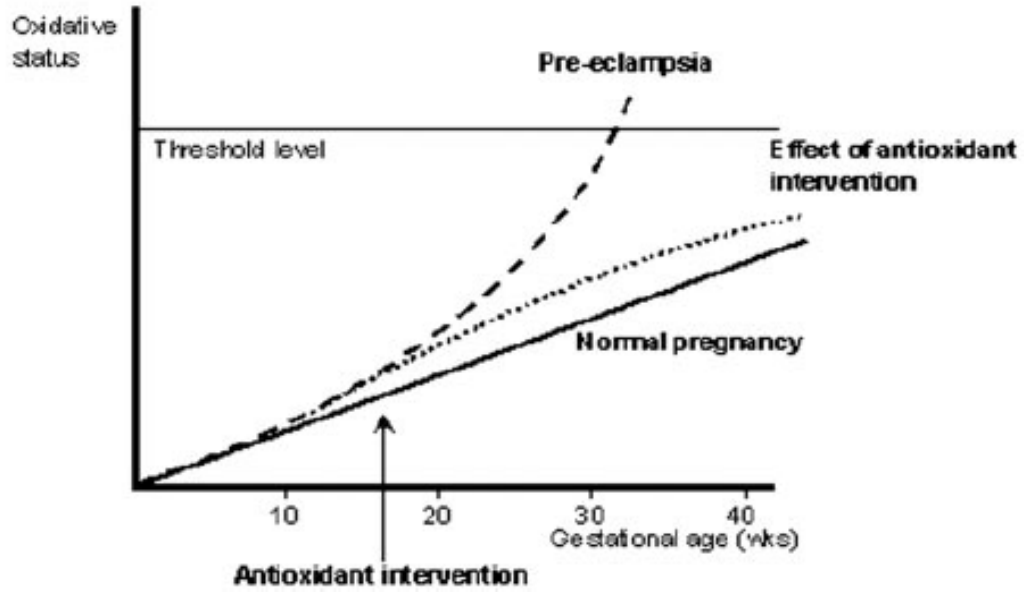


Figure 2. The proposed effect of antioxidant intervention on the development of preeclampsia. Oxidative stress is a normal phenomenon in normotensive pregnancy; however, in preeclampsia, oxidative stress is exaggerated. In the proposed model, preeclampsia develops as oxidative stress reaches a threshold level/point of no return. Antioxidant intervention in early pregnancy may prevent development of preeclampsia by enhancing maternal antioxidant capacity, inhibiting NAD(P)H oxidase activation and preventing an exaggerated inflammatory response.

Teori Kalsium

- Epidemiologic data suggest, however an inverse correlation between dietary calcium intake and incidence of PIH in diverse populations
- In rural Guatemala, despite the low socioeconomic status and low intake of protein and energy of women, the incidence of eclampsia is low (<0.4 per 1000 births)
- Dietary calcium in this population is relatively high (<1100 mg/d), in large part because of the incorporation of lime-processed tortillas as a staple component of the diet.

1980 Belizan dan Villar

Calcium Intake

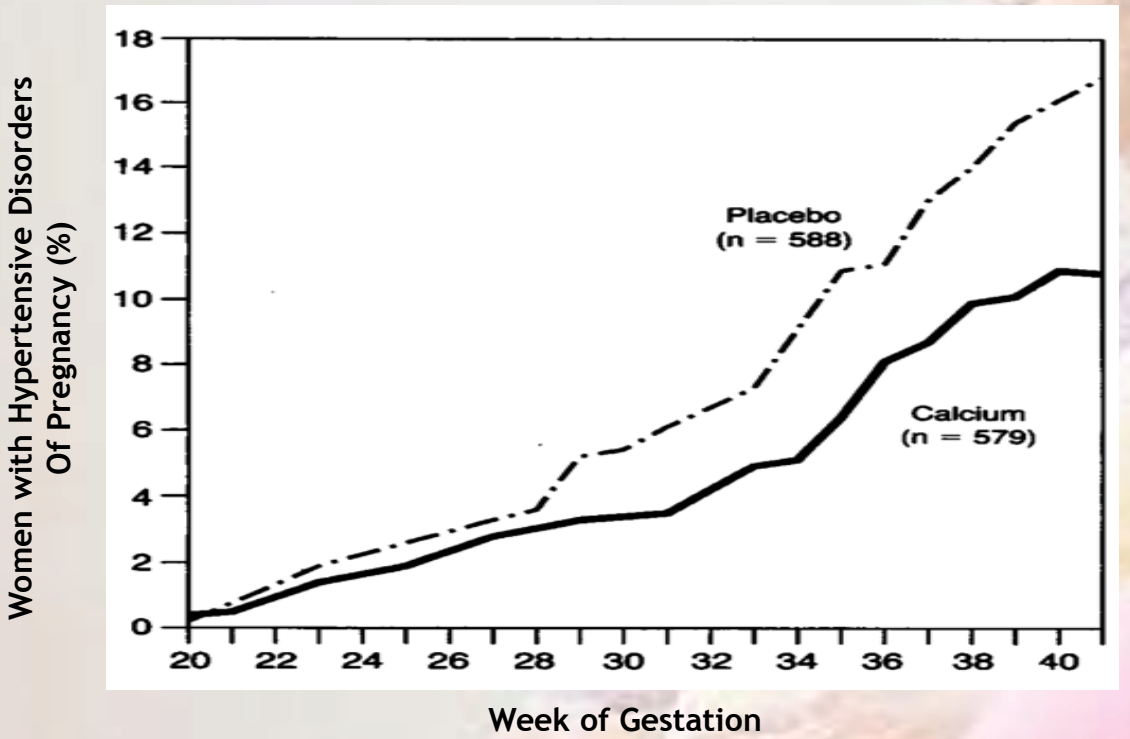
- In addition, a **low calcium intake is associated with an increased risk of pregnancy-induced hypertension** and related obstetric complications,
- **Calcium supplementation has been shown to reduce the blood pressure** of pregnant women and their offspring in some studies
- To what extent these effects indicate the correction of a nutritional deficit or the pharmacologic action of calcium independent of customary calcium intake is, as yet, unknown and needs further detailed research.

DA McCarron, unpublished observations, 1998

MEKANISME TERJADINYA PREEKLAMPSIA

Referensi:
1. Hofmeyr GJ et al.; Calcium supplementation during pregnancy for preventing hypertensive disorders and related problems; Cochrane Database of Systematic Reviews; 2010

Perbandingan kejadian hipertensi kehamilan pada ibu hamil yang diberikan kalsium dan yang tidak



Resiko gangguan hipertensi pada kehamilan secara signifikan **lebih rendah** pada ibu hamil yang diberikan suplementasi kalsium daripada yang tidak[3]

Referensi:

1. Nitkowski J; The Real Calcium Problem and Solution; NutritionReallyWorks.net; 2011
2. Hofmeyr GJ et al.; Calcium supplementation during pregnancy for preventing hypertensive disorders and related problems; Cochrane Database of Systematic Reviews; 2010
3. Belizan et al.; Calcium Supplementation to Prevent Hypertensive Disorders of Pregnancy; The New England Journal of Medicine;1991.

Long-term effect of calcium supplementation during pregnancy on the offspring's blood pressure during childhood

- The risk of high systolic blood pressure was also lower in the calcium group than in the placebo group (relative risk 0.59; 0.39 to 0.90) and particularly among children in the highest fourth of body mass index (0.43; 0.26 to 0.71).
- Conclusion :

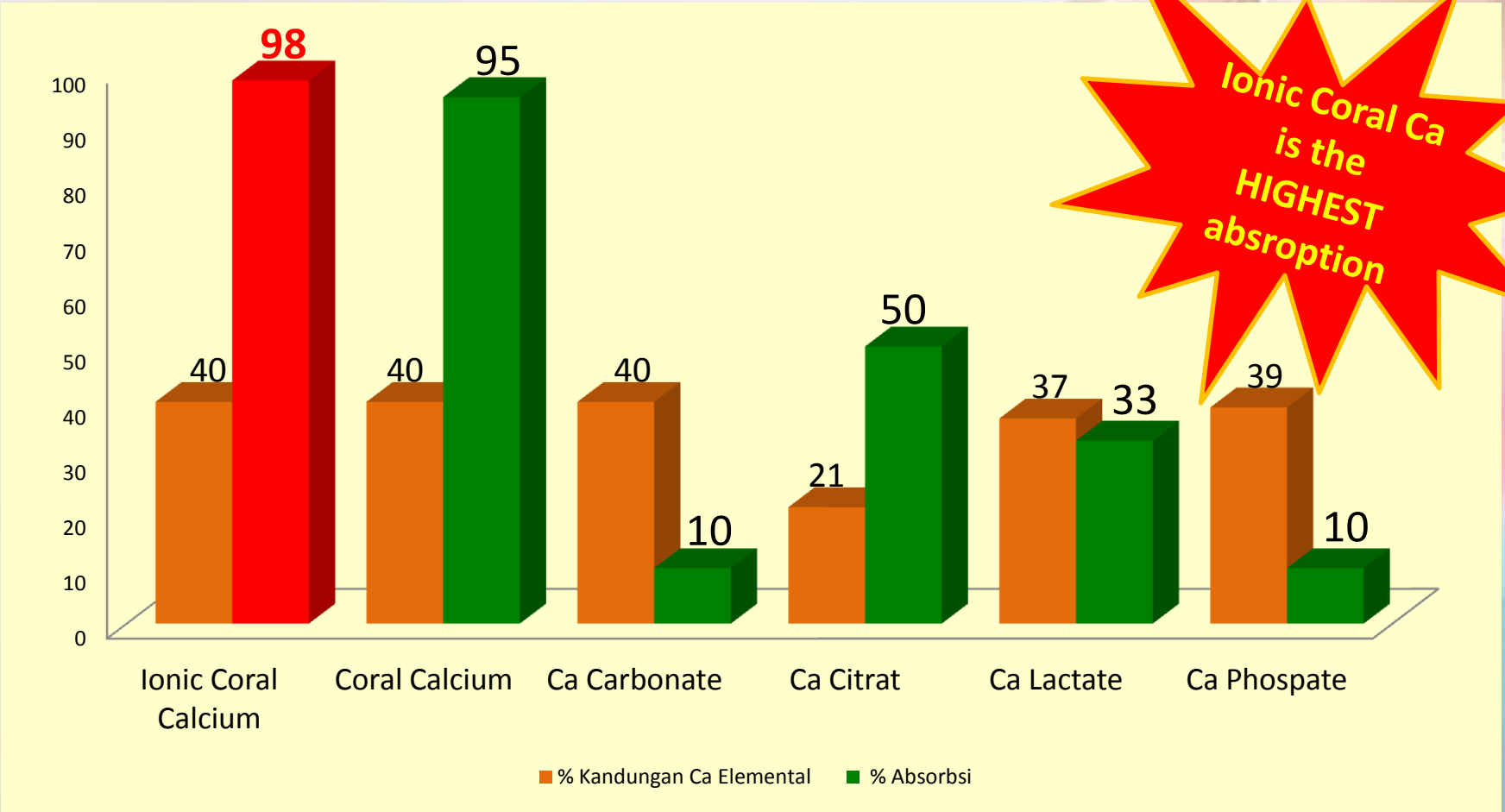
Calcium supplementation during pregnancy is associated with lower systolic blood pressure in the offspring, particularly among overweight children.

Belizan, 1997. British Medical Journal. 315(7103):281-5

Ionic Calcium as Coral Calcium

- Ionic Calcium {Ca++} is available as Coral Calcium.
- Total molecular weight of ionic calcium is 40.09 mg. Ionic calcium is 100% calcium.
- Scientists tell us that 98% of the ionic calcium is absorbed.
- So for every 1,000 mg of Coral Calcium, a unique organic calcium carbonate compound that dissipates calcium directly in its ionic form, 40% is ionic calcium or 400 mg of calcium.
- Of this 400 mg 98% is absorbed, or 392 mg of usable calcium.

Perbandingan Kandungan Kalsium Elemental dan Penyerapan Kalsium Antar Beberapa Jenis Kalsium



Nitkowski J; The Real Calcium Problem and Solution; Nutrition Really Works.net; 2011

Omega-3 dan Pencegahan preeklampsia

- Fish oil, yang kaya akan omega-3 (asam lemak tidak jenuh) diketahui dapat mengurangi kadar trigliserid puasa dan postprandial dan dapat menurunkan reaktifitas platelet dan leukosit serta dapat juga menurunkan tekanan darah.
- Omega-3 juga dapat merubah karakteristik dinding pembuluh darah dan reologi darah.

Referensi:

1. A. Williams et al. Omega-3 fatty acids in maternal erythrocytes and risk of preeclampsia. Seatlle. 1995.

Omega-3 Fatty Acids in Maternal Erythrocytes and Risk of Preeclampsia

Michelle A. Williams,[1–3] *Rosalee W. Zingheim,*[1] *Irena B. King,*[3] *and Arthur M. Zebelman*[4]

Preeclampsia is a systemic disease characterized by diffuse endothelial dysfunction, increased peripheral vascular resistance, coagulation abnormalities, antioxidant deficiency, persistent elevations of maternal leukocyte-derived cytokines, and hyperlipidemia. Fish oil, rich in omega-3 polyunsaturated fatty acids, is known to reduce fasting and postprandial triglycerides and to decrease platelet and leukocyte reactivity; it may also decrease blood pressure. Additionally, omega-3 fatty acids may beneficially influence vessel wall characteristics and blood rheology. In light of the potential beneficial effects of dietary omega-3 fatty acids, we conducted a cross-sectional case-control study to examine the hypothesized exposure-effect relation between maternal dietary intake of marine omega-3 fatty acids and risk of preeclampsia. We measured polyunsaturated fatty acids in erythrocytes obtained from 22 preeclamptic women and 40 normotensive women; we measured polyunsaturated fatty acids as the percentage of total fatty acids from gas chromatography. We employed logistic regression procedures to estimate odds ratios (ORs) and 95% confidence intervals (CIs). After adjusting for confounders, women with the lowest levels of omega-3 fatty acids were 7.6 times more likely to have had their pregnancies complicated by preeclampsia as compared with those women with the highest levels of omega-3 fatty acids (95% CI = 1.4–40.6). A 15% increase in the ratio of omega-3 to omega-6 fatty acids was associated with a 46% reduction in risk of preeclampsia (OR = 0.54; 95% CI = 0.41–0.72). Low erythrocyte levels of omega-3 fatty acids and high levels of some omega-6 fatty acids, particularly arachidonic acid, appear to be associated with an increased risk of preeclampsia. (Epidemiology 1995;6:232–237)

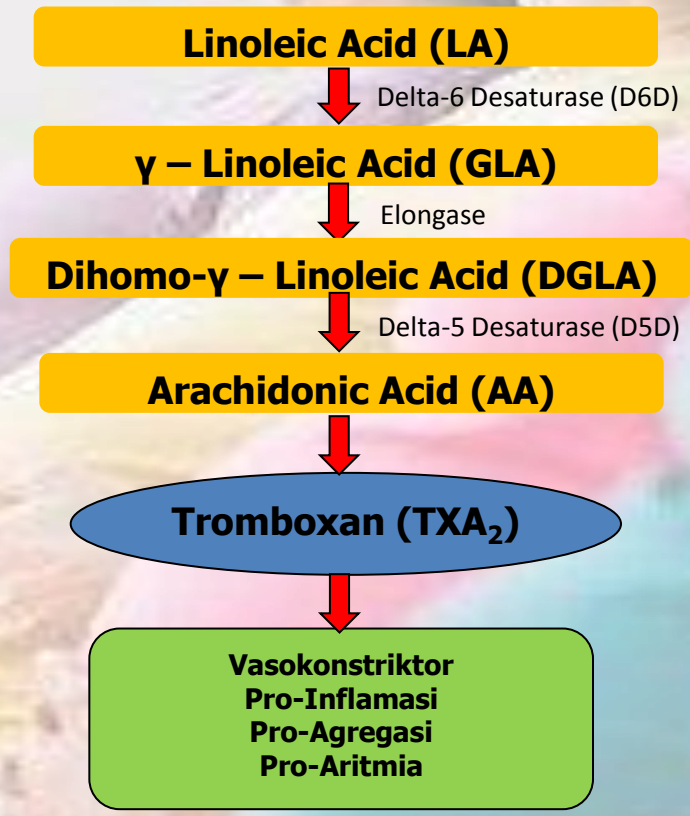
Keywords: diet, hypertension, omega-3 fatty acids, omega-6 fatty acids, preeclampsia, pregnancy, biomarkers.

Referensi:

1. A. Williams et al. Omega-3 fatty acids in maternal erythrocytes and risk of preeclampsia. Seatlle. 1995.

Omega -3 baik dikonsumsi dari awal kehamilan sampai menyusui karena:

- Dapat mengoptimalkan perkembangan otak dan sel syaraf janin/bayi[1]
- Mencegah terjadinya preeklampsia pada saat kehamilan[2][3]
- Omega -3 yang baik **tidak mengandung AA,** karena AA dapat meningkatkan resiko terjadinya preeklampsia saat kehamilan[4]



Referensi:

1. Morse, Nancy L; Benefits of Docohexanoic Acid, Folic Acid, Vit D and Iodine ond Foetal and Infant Brain Development and Function Following Maternal Supplementation during Pregnancy and Lactation; Nutrients. 2012.
2. Mahomed et al; Erythrocyte Omega-3, Omega-6 and Trans Fatty Acids in Relation to Risk of Preeclampsia among Women Delivering at Zimbabwe; Physiological Research.2007.
3. Kulkarni et al; Reduced placental docosahexaenoic acid levels associated with increased levels of sFlt-1 in preeclampsia,2010.
4. Patterson et al; Health Implications of High Dietary Omega-6 Polyunsaturated Fatty Acids; Journal of Nutrition and Metabolism.2011,

HIS NAME IS TODAY

We are guilty of many errors and many faults,

But our worst crime is abandoning the children,

Neglecting the fountain of life,

Many of the things we need can wait,

The child cannot wait.

Right now is the time his bones are being formed,

His blood is being made,

And his senses are being developed,

To him we cannot answer "tomorrow"

His name is TODAY

(Gabriella Mistral, Nobel Prize Poet from Ch