

SPORTS & EXERCISE NUTRITION



DIFFERENT SPORTS, DIFFERENT NEEDS



DIFFERENT SPORTS, DIFFERENT NEEDS

- Jenis Olahraga
- Tujuan Jangka Pendek / Panjang
- Periode Kompetisi
- Komposisi Tubuh / Somatotype
- Rasio Makronutrisi
- Preferensi Sumber Makanan
- Waktu & Frekuensi Makan
- Kebutuhan Khusus

PENTINGNYA GIZI UNTUK ATLET



- Performa
 - Pengisian ulang glikogen
 - Peningkatan massa otot
 - Mempertahankan performa
- Pemulihan
 - Pemulihan sel otot
 - Menghindarkan dari cedera
 - Menjaga kekebalan tubuh

I. PENGUKURAN STATUS GIZI

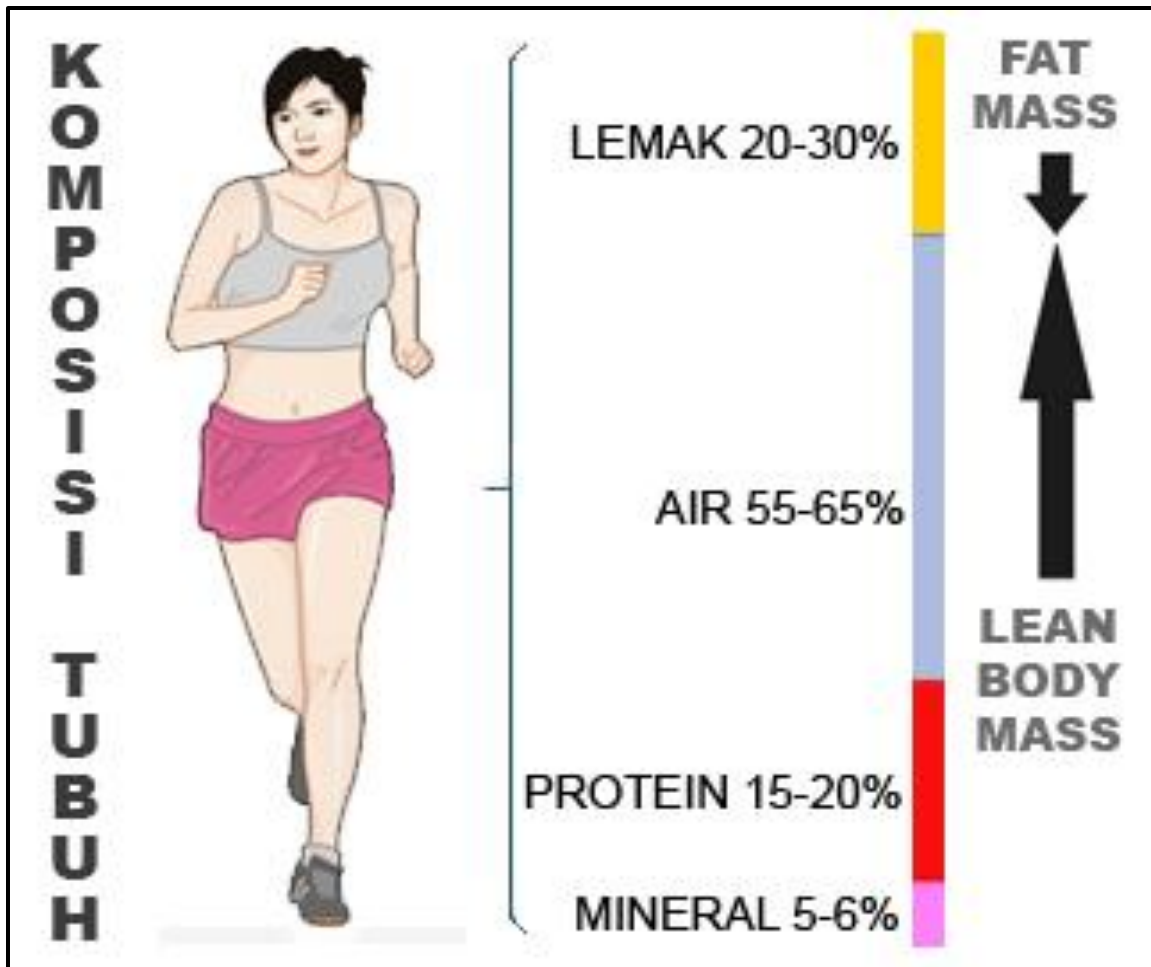
1. Indeks Massa Tubuh

$$\text{IMT} = \frac{\text{Berat Badan (kg)}}{[\text{Tinggi Badan (m)}]^2}$$



KLASIFIKASI	IMT (kg/m ²)
UNDERWEIGHT	< 18.50
Severe Thinness	< 16.00
Moderate Thinness	16.00-16.99
Mild Thinness	17.00-18.49
NORMAL	18.50-24.99
OVERWEIGHT	≥ 25.00
Pre-Obesitas	25.00-29.99
OBESITAS	≥ 30.00
Obesitas Type I	30.00-34.99
Obesitas Type II	35.00-39.99
Obesitas Type III	≥ 40.00

II. KOMPOSISI TUBUH DAN PERFORMA OLAHRAGA



FAKTOR PENGUBAH KOMPOSISI TUBUH

- Pola makan
- Aktivitas fisik
- Proses penuaan
- Kondisi kesehatan

II. KOMPOSISI TUBUH DAN PERFORMA OLAHRAGA

Women

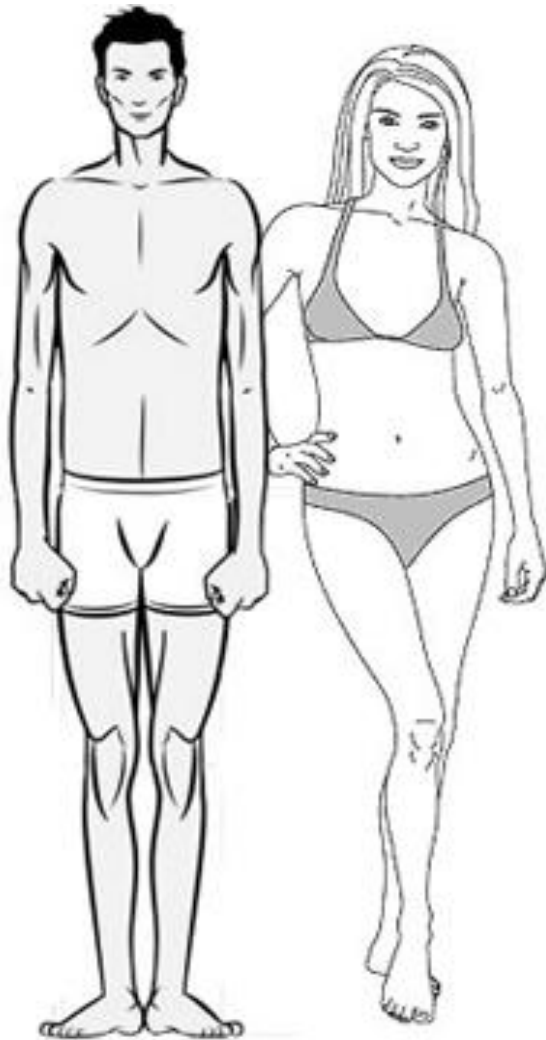
Age	Underfat	Healthy Range	Overweight	Obese
20-40 yrs	Under 21%	21-33%	33-39%	Over 39%
41-60 yrs	Under 23%	23-35%	35-40%	Over 40%
61-79 yrs	Under 24%	24-36%	36-42%	Over 42%

Men

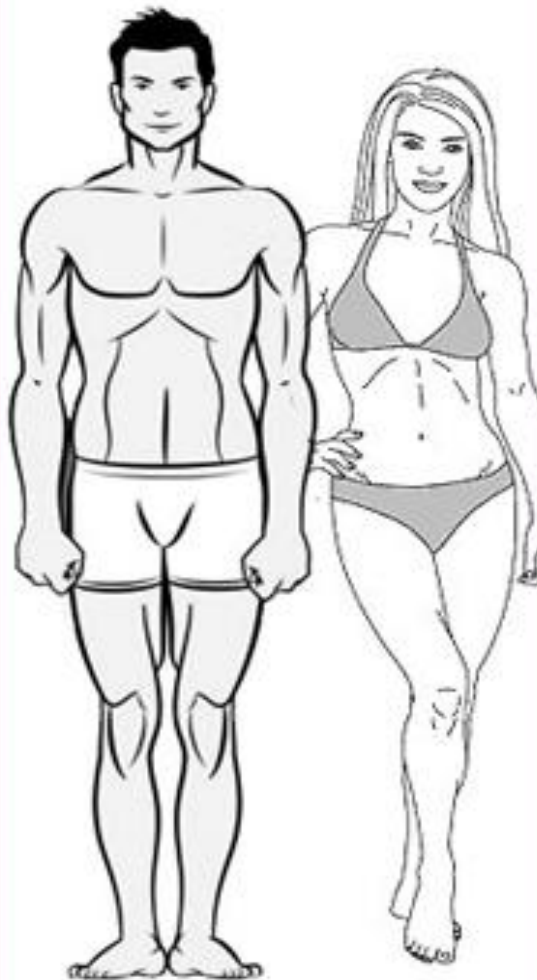
Age	Underfat	Healthy Range	Overweight	Obese
20-40 yrs	Under 8%	8-19%	19-25%	Over 25%
41-60 yrs	Under 11%	11-22%	22-27%	Over 27%
61-79 yrs	Under 13%	13-25%	25-30%	Over 30%

(Gallagher et al. 2000. Am J Clin Nutr. 2000 Sep;72(3):694-701)

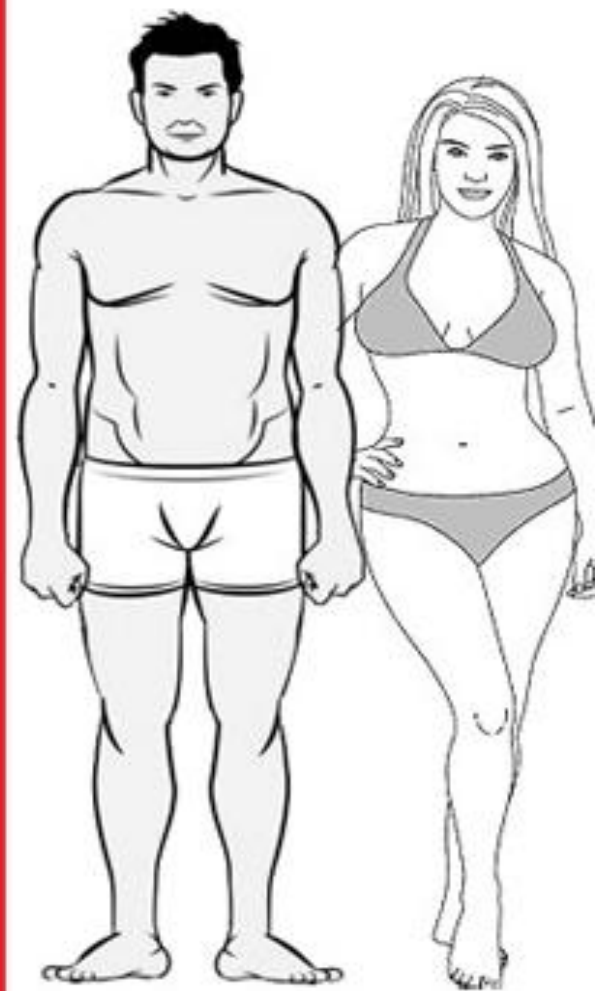
III. SOMATOTYPE



Ectomorph



Mesomorph

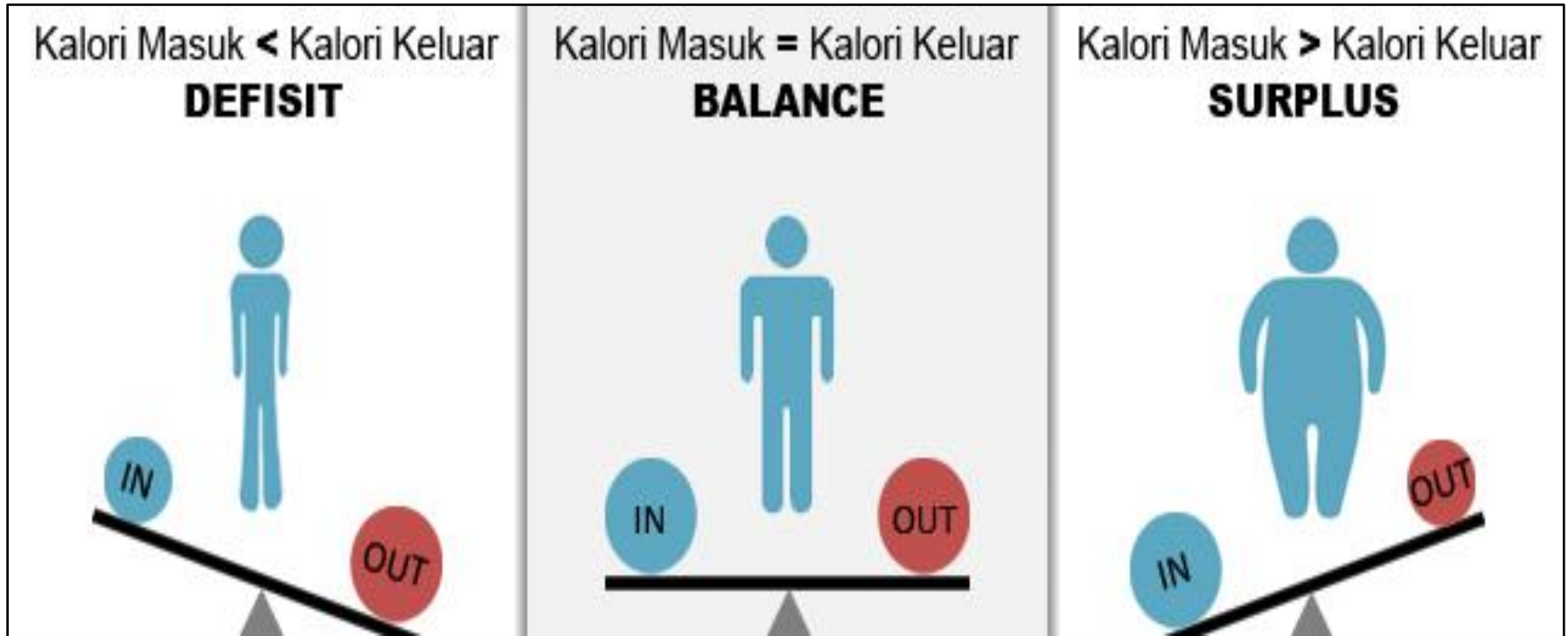


Endomorph

III. SOMATOTYPE



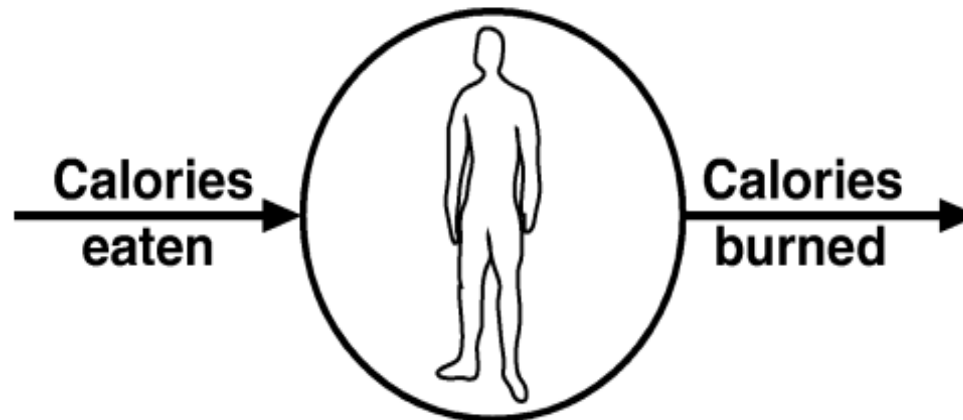
IV. PERSAMAAN KESEIMBANGAN KALORI



IV. PERSAMAAN KESEIMBANGAN KALORI

Pengeluaran Kalori Harian (Total Energy Expenditure)

KALORI MASUK	KALORI KELUAR
• Makanan yang dikonsumsi	• Basal Metabolic Rate (BMR) • Thermic Effect of Food (TEF) • Aktivitas fisik

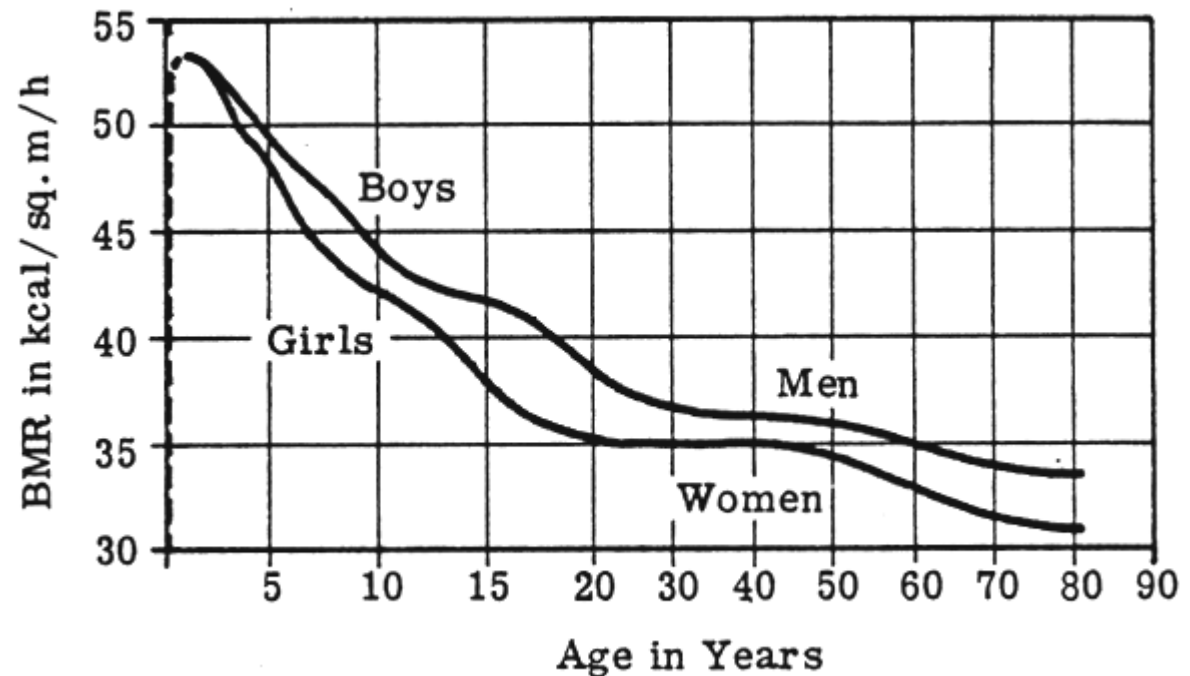


IV. PERSAMAAN KESEIMBANGAN KALORI

1. Basal Metabolic Rate (BMR)

Faktor yang mempengaruhi:

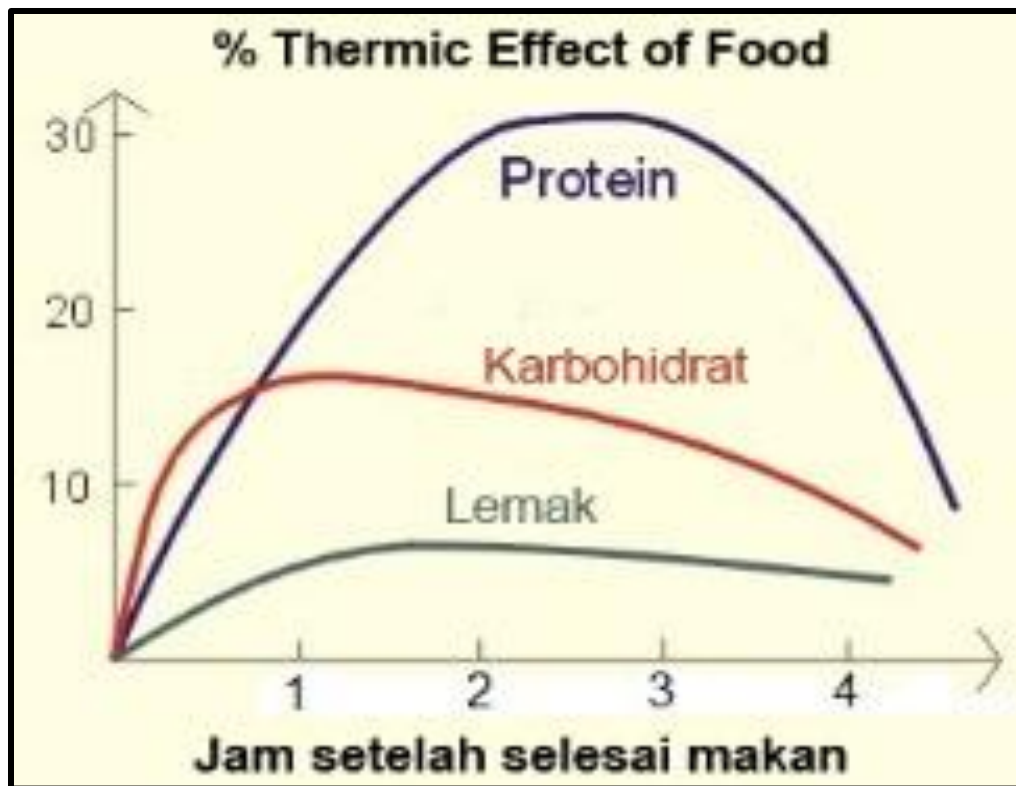
1. Komposisi tubuh
2. Usia
3. Bobot Badan
4. Tinggi badan
5. Jenis Kelamin



Source: www.fao.org

IV. PERSAMAAN KESEIMBANGAN KALORI

2. Thermic Effect of Food (TEF)



Perbandingan TEF

- Protein 25-30%
- Karbohidrat 10-15%
- Lemak 03-05%

(Glickman et al. The Journal of nutrition 1948.36(1):41-57)

IV. PERSAMAAN KESEIMBANGAN KALORI

3. Aktivitas Fisik

- Kegiatan yang butuh energi
- Ringan ke berat



Estimasi aktivitas fisik dalam TEE = 20-25%

V. MENGHITUNG KEBUTUHAN KALORI

1. Menghitung Basal Metabolic Rate (BMR)

PERSAMAAN HARRIS BENEDICT UNTUK MENGHITUNG BASAL METABOLIC RATE (BMR)	
LAKI - LAKI	$88,36 + (13,4 \times \text{berat kg}) + (4,8 \times \text{tinggi cm}) - (5,68 \times \text{umur tahun})$
PEREMPUAN	$447,60 + (9,25 \times \text{berat kg}) + (3,1 \times \text{tinggi cm}) - (4,30 \times \text{umur tahun})$



2. Menghitung TEE= BMR X Level Aktivitas Fisik

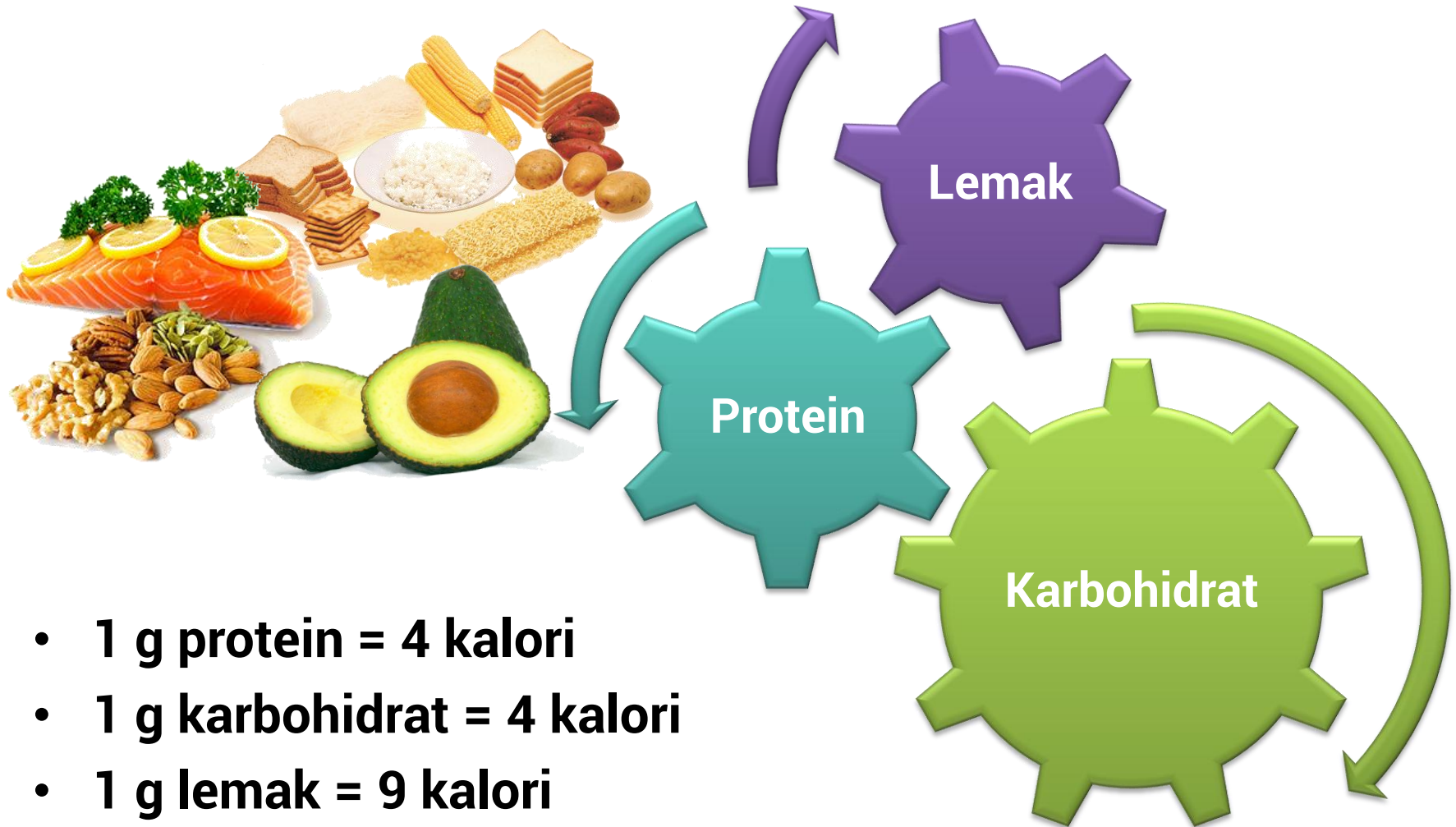


LEVEL AKTIVITAS FISIK	Total Energy Expenditure (TEE)
Tidak aktif (tidak ada berolahraga)	BMR x 1,2
Cukup aktif (berolahraga 1-3x /minggu)	BMR x 1,375
Aktif (berolahraga 3-5x /minggu)	BMR x 1,55
Sangat Aktif (berolahraga 6-7x /minggu)	BMR x 1,725



BASIC NUTRITION

I. MAKRONUTRISI



PROTEIN INTAKE RECOMMENDATION



- Orang dewasa (18+) = **0,8g/kg BB** (Otten 2006)
- Physically Active **1,6-1,8g/kg BB** (Phillips 2011)

DAYA SERAP PROTEIN

Table 1. Protein quality rankings.

Protein Type	Protein Efficiency Ratio	Biological Value	Net Protein Utilization	Protein Digestibility Corrected Amino Acid Score
Beef	2.9	80	73	0.92
Black Beans	0		0	0.75
Casein	2.5	77	76	1.00
Egg	3.9	100	94	1.00
Milk	2.5	91	82	1.00
Peanuts	1.8			0.52
Soy protein	2.2	74	61	1.00
Wheat gluten	0.8	64	67	0.25
Whey protein	3.2	104	92	1.00

Adapted from: U.S Dairy Export Council, Reference Manual for U.S. Whey Products 2nd Edition, 1999 and Sarwar, 1997.

2. KARBOHIDRAT



- Sumber energi
- Berperan dalam oksidasi lemak
- Agar protein tidak digunakan sebagai energi

CARBS SIDE EFFECT

Kelebihan:

- Disimpan dalam hati, otot, dan sel lemak
- Tidak banyak manfaat tambahan



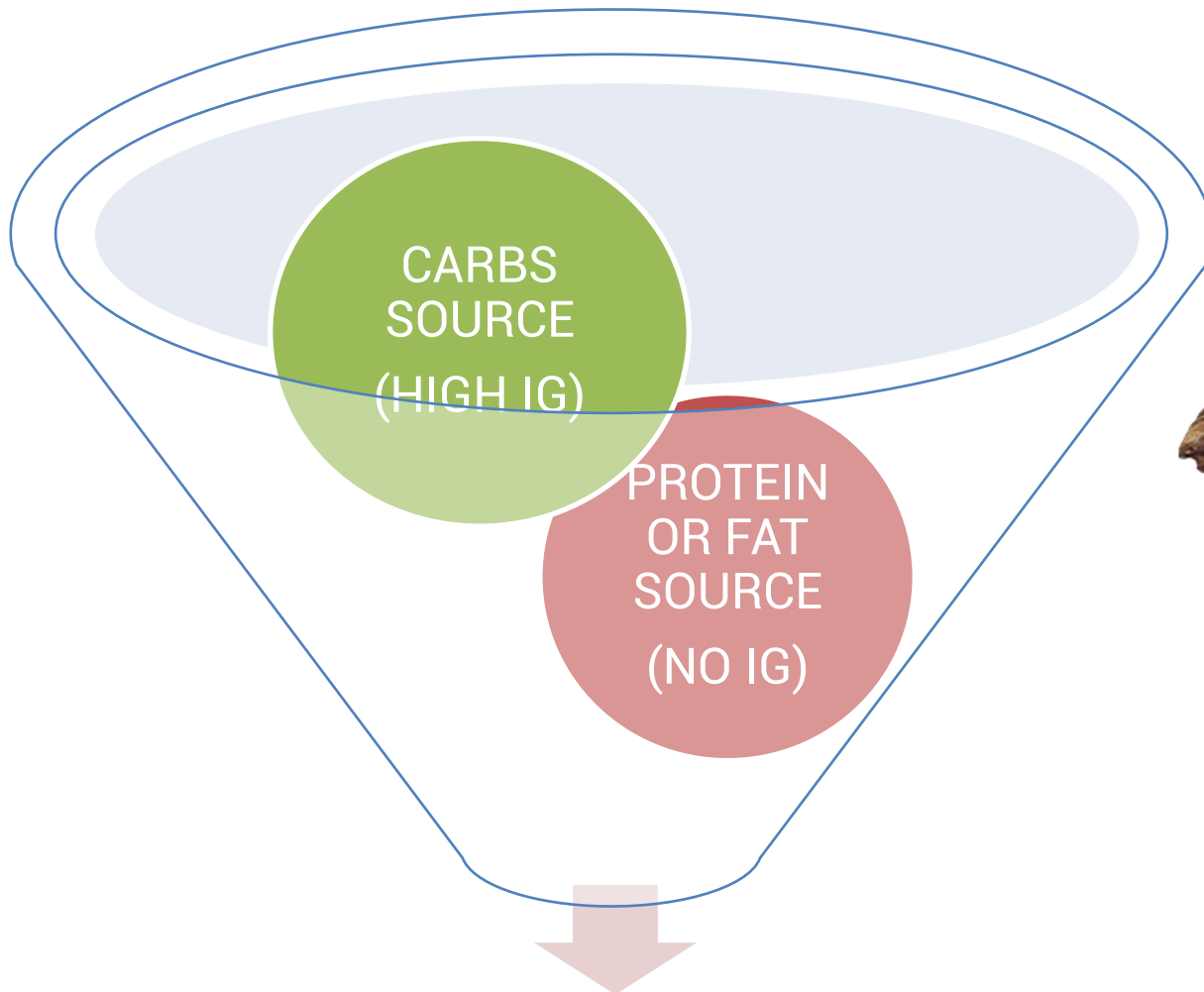
GLYCAEMIC INDEX

> 70 → Sederhana

< 55 → Kompleks

Low GI (< 55)					
Peanuts	14	Spaghetti	38	Carrots	47
Fructose	19	Apples	38	Bulgur wheat	48
Cherries	22	Tinned peaches (in fruit juice)	39	Peas	48
Grapefruit	25	Pear	38	Baked beans	48
Lentils (red)	26	Yoghurt drink	38	Muesli	49
Whole milk	27	Protein bar	38	Boiled potato	50
Chick peas	28	Plum	39	Rye bread	50
Red kidney beans	28	Apple juice	40	Mango	51
Lentils (green/brown)	30	Strawberries	40	Strawberry jam	51
Butter beans	31	All-Bran	42	Banana	52
Apricot (dried)	31	Orange	42	Orange juice	52
Meal replacement bar	31	Peach	42	Kiwi fruit	53
Skimmed milk	32	Milk chocolate	43	Buckwheat	54
Protein shake	32	Muffin, apple	44	Sweetcorn	54
Fruit yoghurt, fruit (low-fat)	32	Sponge cake	46	Crisps	54
Chocolate milk	34	Grapes	46	Muesli (Alpen)	55
Custard	35	Pineapple juice	46	Honey	55
Plain low-fat yoghurt	36	Macaroni	47	Brown rice	55
Moderate GI (56–69)					
Potato – boiled, old	56	Apricots	57	Digestive biscuits	59
Sultanas	56	Porridge	58	Pineapple	59
Energy bar	56	Basmati rice	58	Pizza	60
Pitta bread	57	Squash (diluted)	58	Ice cream	61
Sweet potato	61	Raisins	64	Croissant	67
Muesli bar	61	Couscous	65	Sucrose	68
Tortillas/corn chips	63	Cantaloupe melon	65	Weetabix	74
White rice	64	Mars bar	65	Shredded wheat	75
Shortbread	64	Instant porridge	66		
High GI (>70)					
White bread	70	Cheerios	74	Cornflakes	81
Millet	71	Bran flakes	74	Rice Krispies	82
Wholemeal bread	71	Mashed potato	74	Baked potato	85
Bagel	72	Chips	75	French baguette	95
Breakfast cereal bar (crunchy nut cornflakes)	72	Rice cakes	78	Lucozade	95
Watermelon	72	Gatorade	78		

GLYCAEMIC INDEX



III. LEMAK

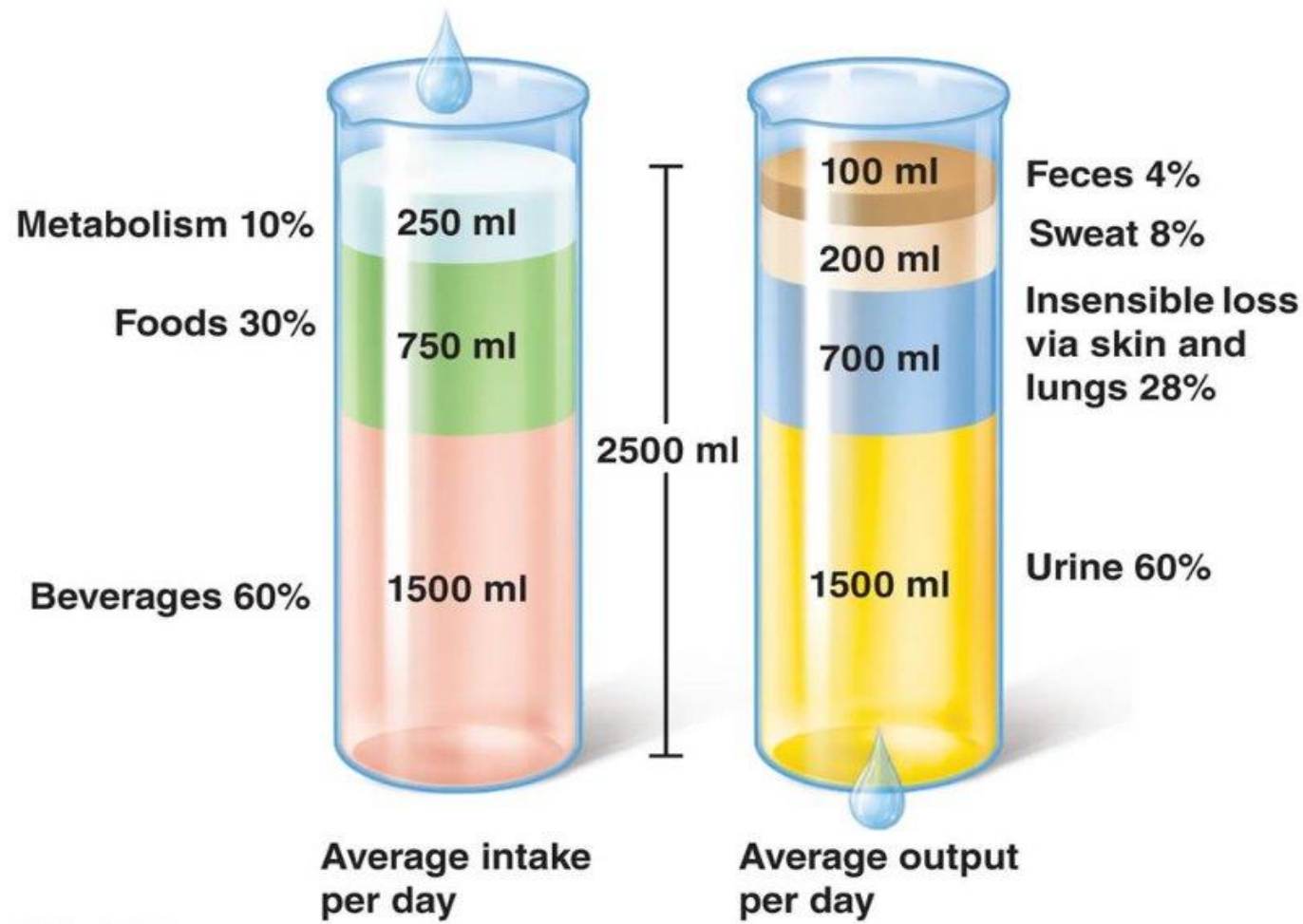


DAILY FAT INTAKE

Asupan lemak yang
disarankan **20-35%**
dari kebutuhan harian

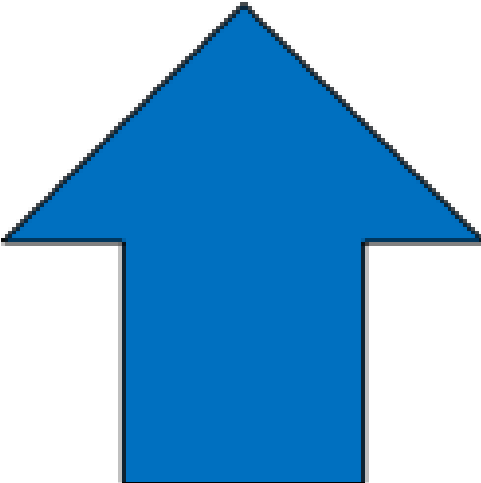


III. KESEIMBANGAN CAIRAN TUBUH



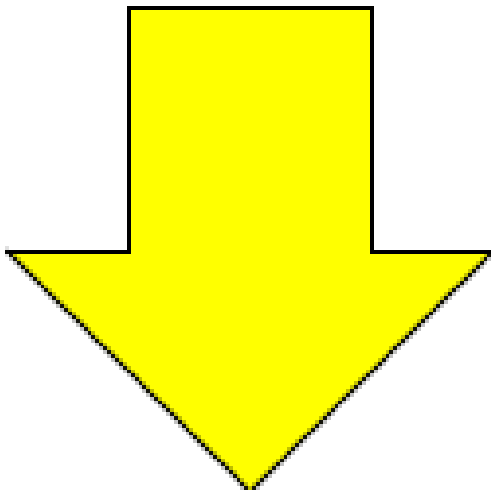
Air yang keluar = air yang masuk

III. KESEIMBANGAN CAIRAN TUBUH



Increases sweat rate (+)

- Higher temperature / more humidity
- Higher exercise intensity
- Less acclimatized
- Poorer fitness level
- Larger athlete



Decreases sweat rate (-)

- Cooler temperatures / less humidity
- Lower exercise intensity
- More acclimatized
- Better fitness level

III. KESEIMBANGAN CAIRAN TUBUH



Radiasi



Konveksi



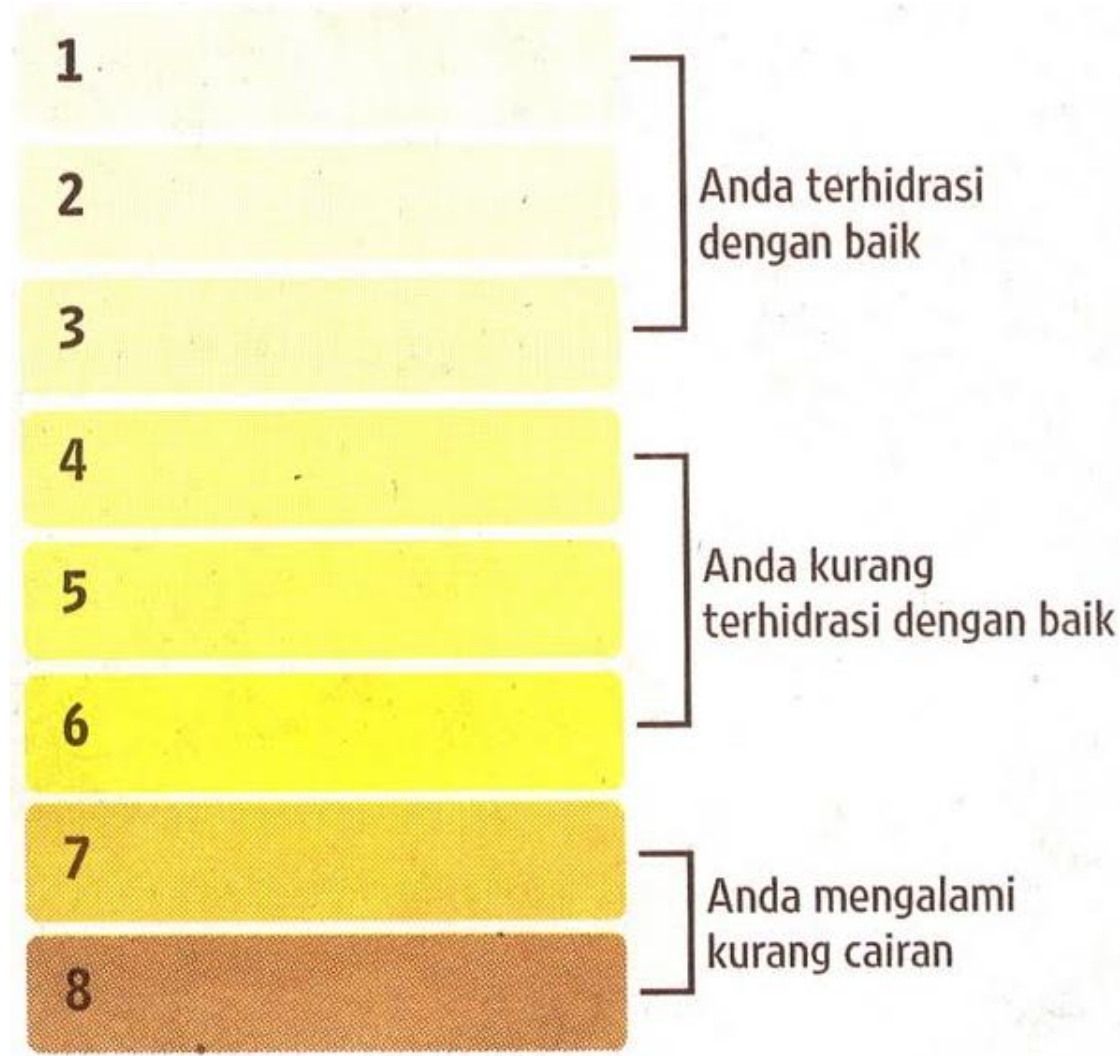
Evaporasi



Konduksi

INDIKASI DEHIDRASI

- Urin Keruh
- Bibir Kering
- Merasa Haus
- Tenggorokan Kering



SUMBER CAIRAN TUBUH

1. Konsumsi $\frac{3}{4}$ asupan cairan sehari dengan air putih
2. Konsumsi Sport drink apabila olahraga >90 menit



INTOLERANSI DAN ALERGI MAKANAN



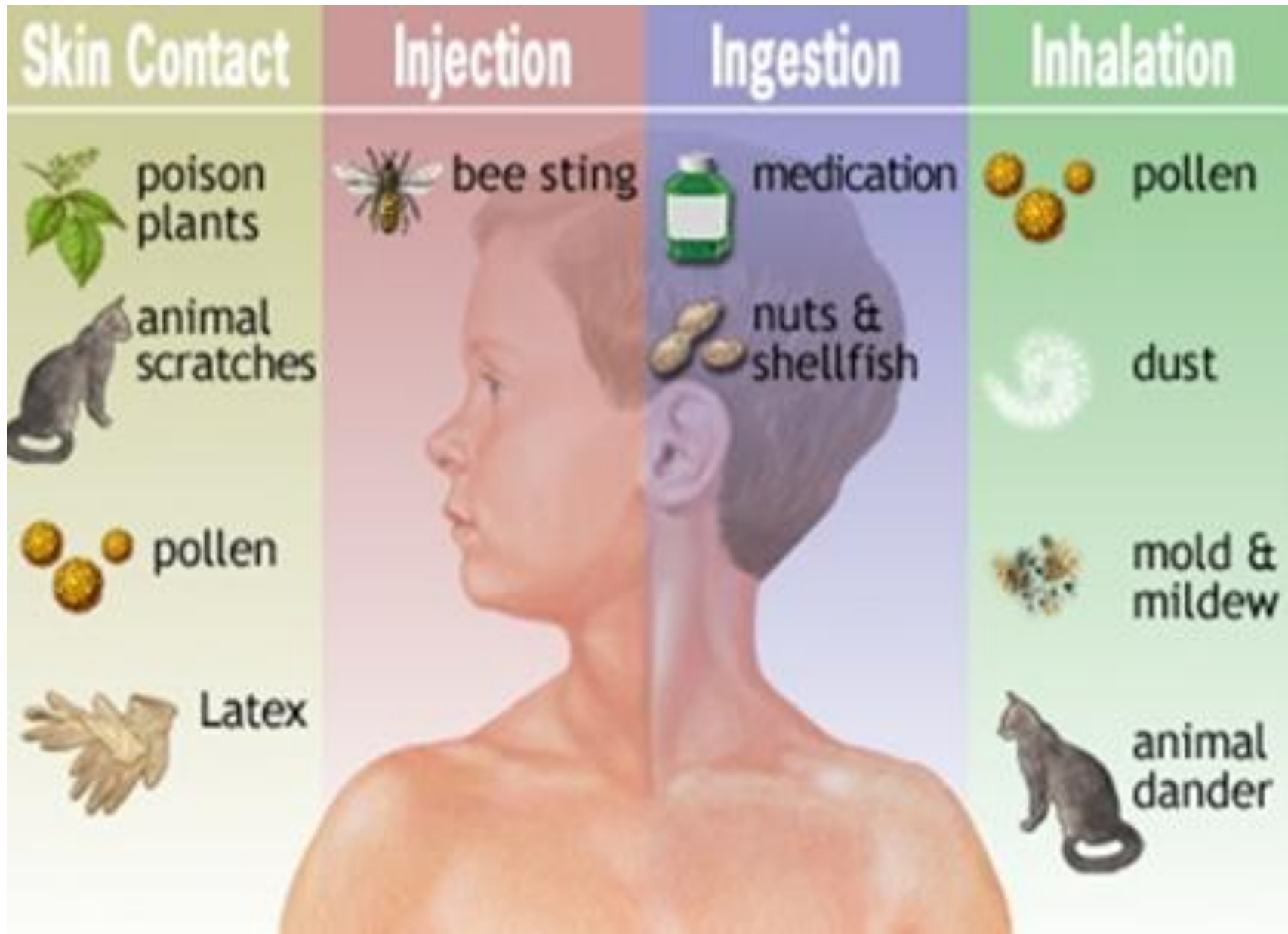
Intoleransi makanan

Ketidakmampuan tubuh mencerna makanan tertentu.
Gejala: kram perut, kembung dan diare

Alergi makanan

Menyerupai intoleransi, namun memiliki potensi lebih fatal. (Melibatkan sistem kekebalan tubuh)
Gejala: sakit perut, ruam, gatal, bengkak pada mulut & sulit bernafas.

SEBAB ALERGI



SEBAB ALERGI

Beberapa makanan yang menimbulkan alergi:



Tree Nuts



Peanuts



Wheat



Soya



Milk



Eggs

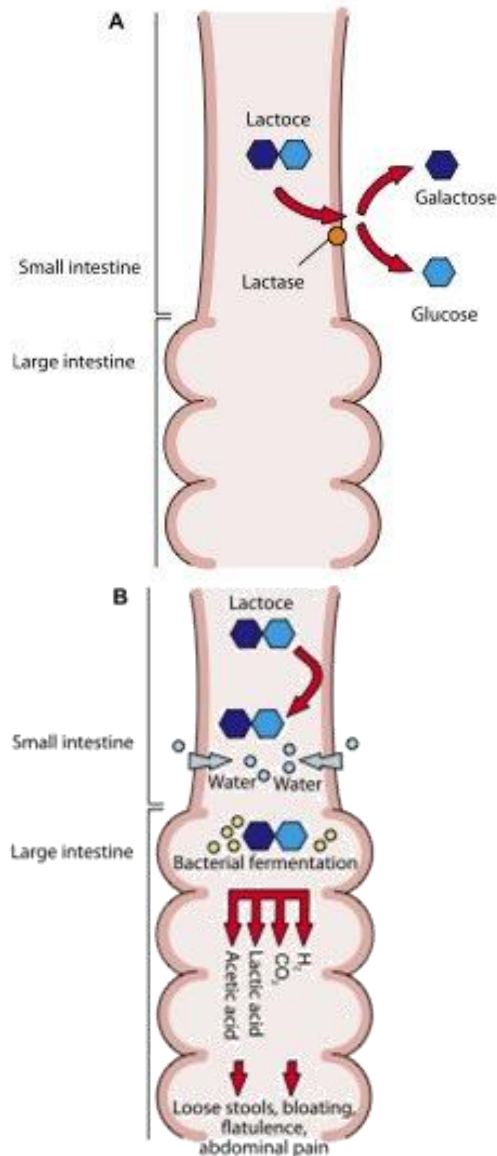


Fish



Crustacean
Shellfish

SEBAB INTOLERANSI



**Kekurangan
enzim tertentu**

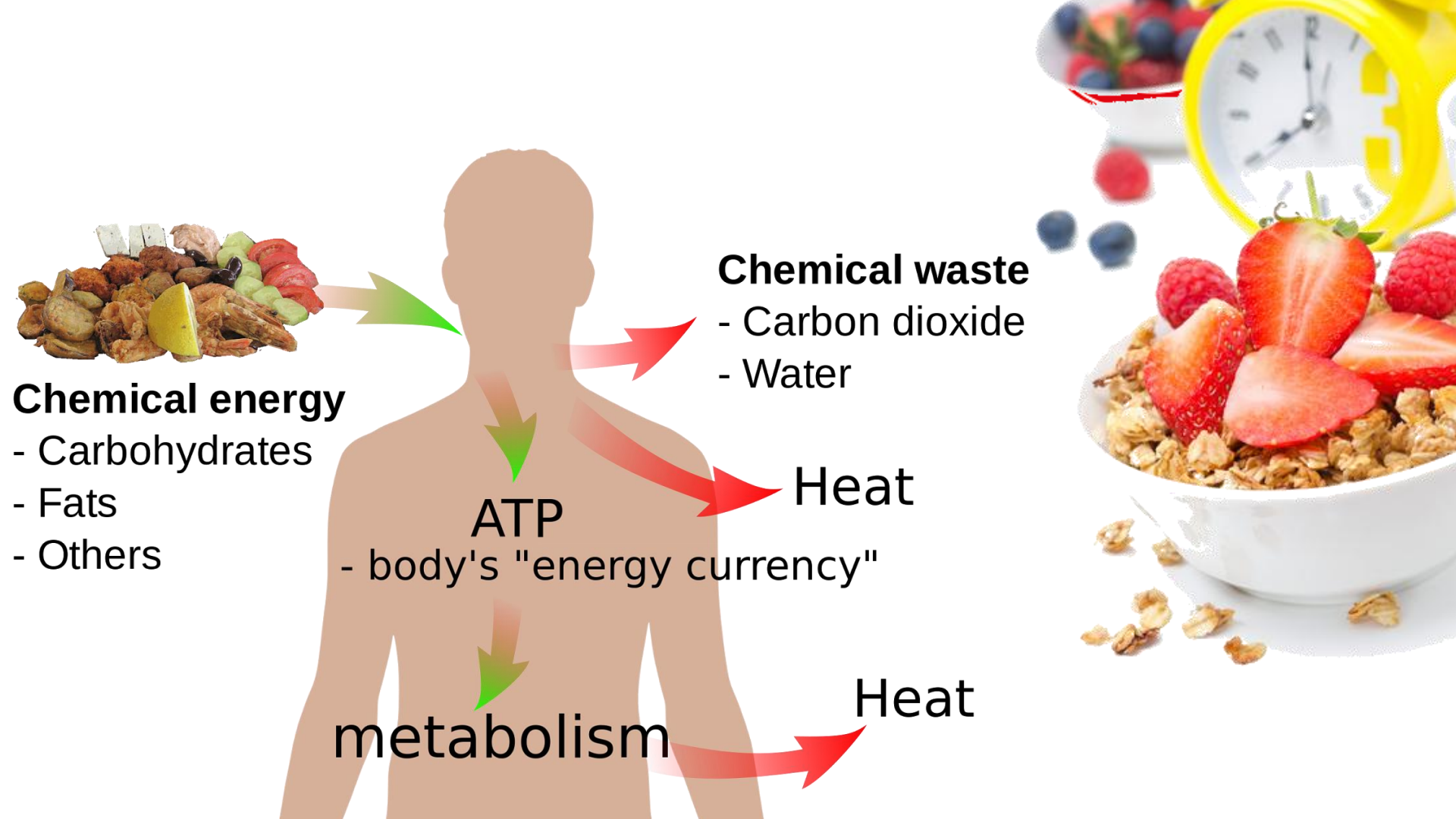
**Sindrom iritasi
perut**

**Keracunan
makanan**

**Bahan
tambahan
pangan dalam
makanan**

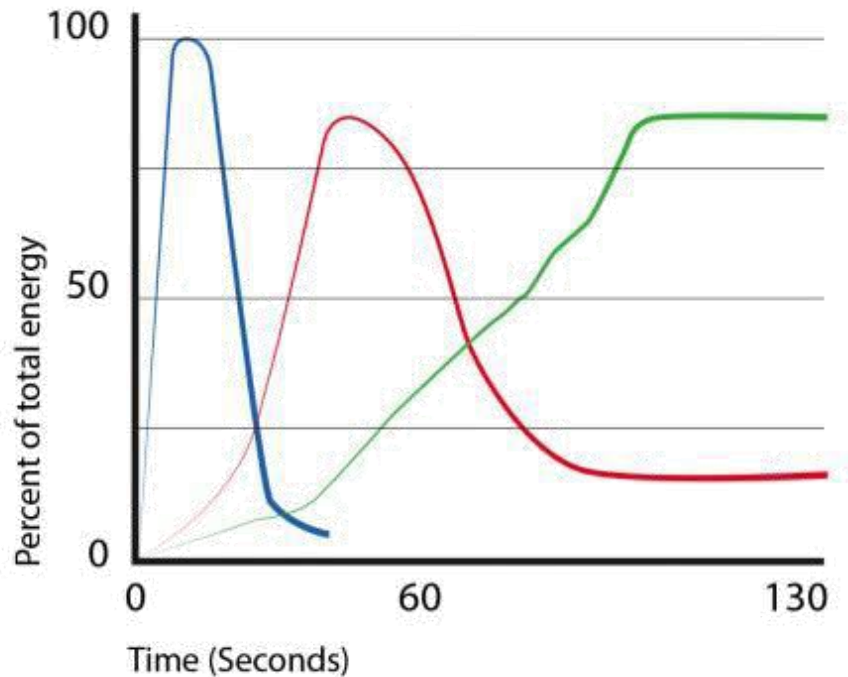
**Stres atau
faktor
psikologis**

Celiac disease



BIOENERGETIC AND NUTRITION TIMING

ENERGY SYSTEM



Phosphagen system

8-10 seconds (100 m)



Glycogen-lactic acid system

1.3-1.6 minutes (400 m)



Aerobic respiration

Unlimited time (15 Km)

©2000 How Stuff Works

	Aerobik	Anerobik
Energi yang dihasilkan	Banyak (32-34 ATP)	Sedikit (2-4 ATP)
Menggunakan Oksigen	Ya	Tidak
Laju pembentukan ATP	Lambat	Cepat
Ketersediaan ATP	>2 menit	< 2 menit

ENERGY SYSTEM

	% Aerobic	% Anaerobic	
1-3 seconds	0	100	Olympic Lifting 100-meter dash Gymnastics Diving Football Basketball
10 seconds	10	90	200-meter dash 100-meter swim Ice Hockey Wrestling Baseball Volleyball
30 seconds	20	80	400-meter dash Field Hockey Soccer Tennis
60 seconds	30	70	
2 minutes	40	60	800-meter dash 200-meter swim Boxing 1500-meter skate
	50	50	
	60	40	2000-meter row 400-meter swim 1-mile run
4 minutes	70	30	
	80	20	2-mile run 800-meter swim
10 minutes	90	10	
30 minutes	100	0	Cross-country run, row, ski, swim, bike, skate Marathon running
120 minutes			



RASIO MAKRONUTRISI

- 40% Protein – 40% Karbohidrat – 20% Lemak
- 1.5-2g x BB Protein, 5-10g x BB Karbo, sisa Lemak

MEAL TIMING & FREQUENCY

- Pagi – Siang – Malam
- 3 Makan Utama dan 2 Snack
- 2 Makan Utama
- 5-6 Makan Utama

OLAHRAGA PERUT KOSONG

Pembakaran lemak meningkat

Gula darah menurun (hipoglikemi)

Tubuh terasa lemas, cepat lelah dan lapar berlebih

Konsentrasi menurun sehingga mudah cedera

Menurunkan daya tahan dan massa otot (jangka panjang)



PRE-KOMPETISI

- Mempersiapkan gula darah
- Menghidrasi tubuh

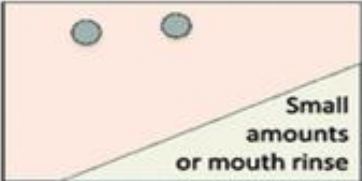
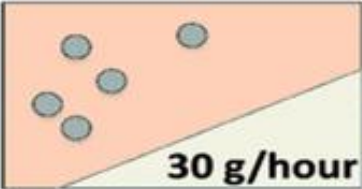
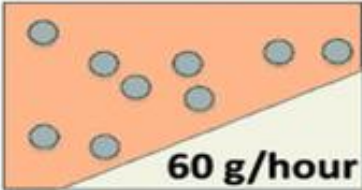
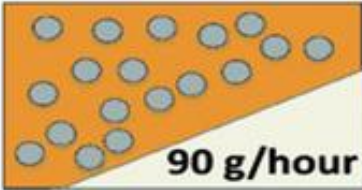
INTRA-KOMPETISI

- Mempertahankan kadar gula darah
- Menjaga status hidrasi

POST-KOMPETISI

- Pemulihan

EXERCISE DURATION TO CARBS RATIO

Duration of exercise	Amount of carbohydrate needed	Recommended type of carbohydrate	Additional recommendation
30–75 minutes	 Small amounts or mouth rinse	Single or multiple transportable carbohydrates	Nutritional training recommended
1–2 hours	 30 g/hour	Single or multiple transportable carbohydrates	Nutritional training recommended
2–3 hours	 60 g/hour	Single or multiple transportable carbohydrates	Nutritional training highly recommended
> 2.5 hours	 90 g/hour	ONLY multiple transportable carbohydrates	Nutritional training essential

source: Jeukendrup AE, Jentjens R. Oxidation of carbohydrate feedings during prolonged exercise: current thoughts, guidelines and directions for future research)

PRE-INTRA-POST FLUID

Olahraga	Waktu	Hidrasi
Lari dan bersepeda	2-4 jam sebelum olahraga	minum 5-7 ml/kg ($\pm$ 350-500 ml)
	$\leq$ 1 jam sebelum olahraga	minum 100-250 ml
	selama olahraga pendek (<1 jam)	minum ketika haus, sedikit namun sering)
	selama olahraga panjang (1-2 jam)	minum 400-800 ml/jam, ketika haus, sedikit namun sering
	selama olahraga panjang (> 2 jam)	minum 400-800 ml/jam, ketika haus, sedikit namun sering
	> 1 jam setelah olahraga panjang	minum 750 ml setiap kehilangan berat badan 0,5 kg

PRE-INTRA-POST FLUID

Olahraga	Waktu	Hidrasi
Berenang dan olahraga beregu (rugby, sepak bola, basketball, tenis, dll)	2-4 jam sebelum olahraga	minum 5-7 ml/kg ($\pm$ 350-500 ml)
	$\leq$ 1 jam sebelum olahraga	minum $\pm$ 100-250 ml
	selama olahraga (<1 jam)	minum ketika haus, sedikit namun sering)
	selama olahraga (> 1 jam)	minum 125 ml/km ketika haus, sedikit namun sering
	> 1 jam setelah olahraga	minum 750 ml setiap kehilangan berat badan 0,5 kg

Sumber: Bean A. 2014. Food for Fitness. London: Bloomsbury

PRE-INTRA-POST CARBS

Olahraga	Waktu	Energi yang dibutuhkan
Lari dan bersepeda	2-4 jam sebelum olahraga	makan 2-4 g karbohidrat/kg ($\pm$ 100-200 g)
	$\leq$ 1 jam sebelum olahraga	makan 1 g karbohidrat/kg ($\pm$ 50-70 g)
	selama olahraga pendek (<1 jam)	tidak dibutuhkan
	selama olahraga panjang (1-2 jam)	15-30 g karbohidrat setiap 15-30 menit dengan total 30-60 g / jam
	selama olahraga panjang (> 2 jam)	30-60 g / jam (hingga 90 g jika berlari > 3 jam)
	> 1 jam setelah olahraga panjang	makan makanan selingan dengan rasio 3:1 antara karbohidrat dengan protein

PRE-INTRA-POST CARBS

Olahraga	Waktu	Energi yang dibutuhkan
Berenang dan olahraga beregu (rugby, sepak bola, basketball, tenis, dll)	2-4 jam sebelum olahraga	makan 2-4 g karbohidrat / kg ($\pm$ 100-200 g)
	$\leq$ 1 jam sebelum olahraga	makan 1 g karbohidrat/kg ($\pm$ 50-70 g)
	selama olahraga (jam)	tidak dibutuhkan
	selama olahraga (jam)	15-30 g karbohidrat setiap 15-30 menit dengan total 30-60 g / jam
	> 1 jam setelah olahraga	makan makanan selingan dengan rasio 3:1 antara karbohidrat dengan protein

PERSONAL DATA

Usia:
Somatotype:
Tujuan:
Metode Diet:

ESTIMATED DAILY NUTRITION

Protein:
Karbohidrat:
Lemak:
Kalori:

PROGRESS

Tanggal:					
Bobot badan:					
Kadar lemak:					

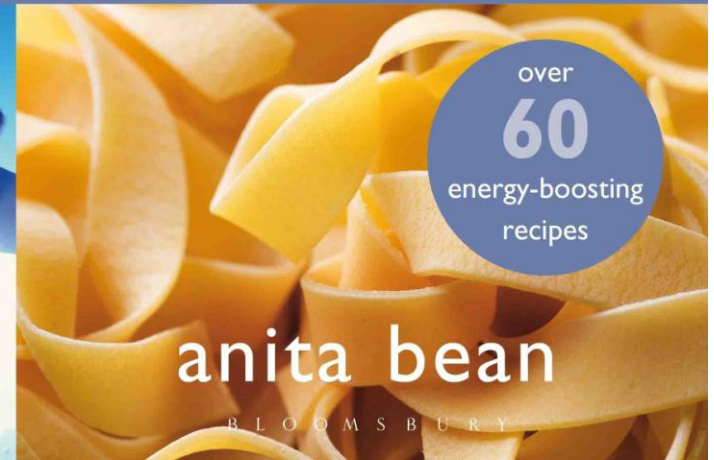
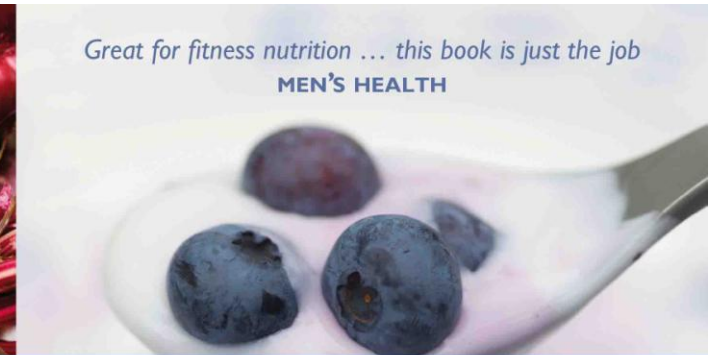
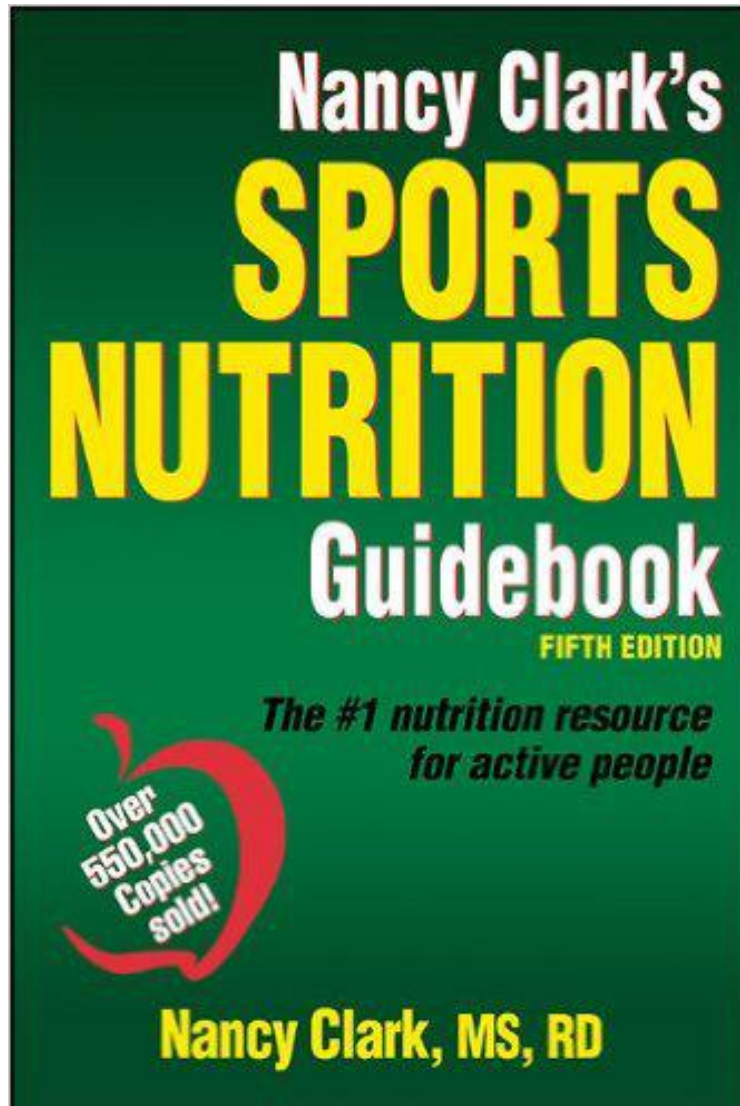
CATATAN:

DAILY FOOD JOURNAL

Tanggal:

Jam	Nama Makanan	Jumlah	Makronutrisi			Kalori	Catatan
			Protein	Karbo	Lemak		
SUB TOTAL							
SUB TOTAL							
SUB TOTAL							
SUB TOTAL							
TOTAL							

RECOMMENDED BOOKS



UPCOMING CERTIFICATION



**SPORTS NUTRITION
CERTIFICATION**

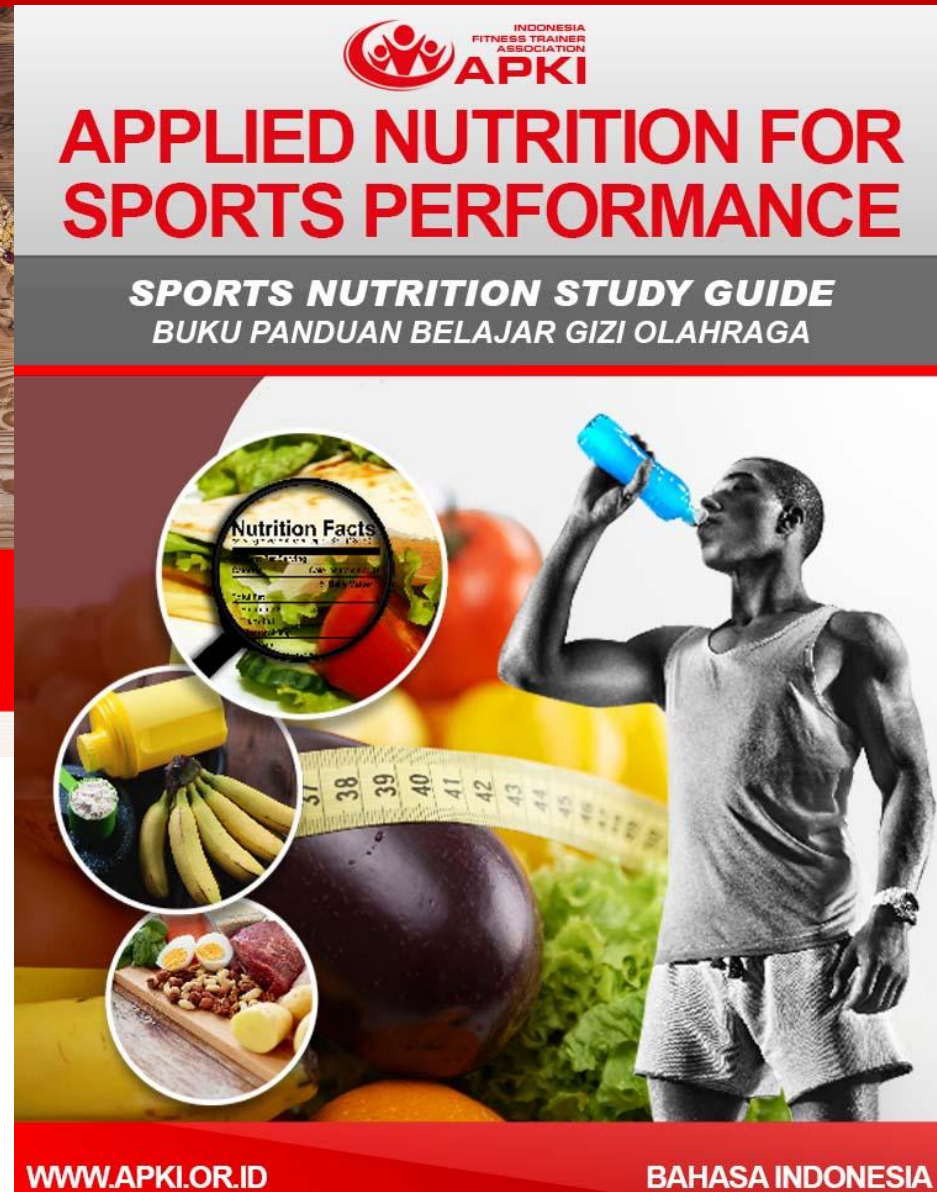
FOR FITNESS PROFESSIONAL

Investasi
Rp. 3.000.000,-

17 DESEMBER 2016

CSN
CERTIFIED SPORTS NUTRITION ADVISOR
INDONESIA FITNESS TRAINER ASSOCIATION

**Trainer should learn
Sports Nutrition!**



APKI
INDONESIA FITNESS TRAINER ASSOCIATION

**APPLIED NUTRITION FOR
SPORTS PERFORMANCE**

SPORTS NUTRITION STUDY GUIDE
BUKU PANDUAN BELAJAR GIZI OLAH RAGA

WWW.APKI.OR.ID

BAHASA INDONESIA