



**Department of Physical and Rehabilitation Medicine with the postgraduation
course**

Obesity as a risk factor for cardiovascular and endocrine diseases. Principles of rational nutrition.

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Year 2022

Lecture plan

1. Principles of rational nutrition
2. Rule of energy adequacy of nutrition
3. Rule of nutritional (and plastic) adequacy of nutrition
4. Rule of enzymatic adequacy of nutrition
5. Rule of biotic adequacy of nutrition
6. Rule of biorhythmological adequacy of nutrition

Diseases associated with improper nutrition

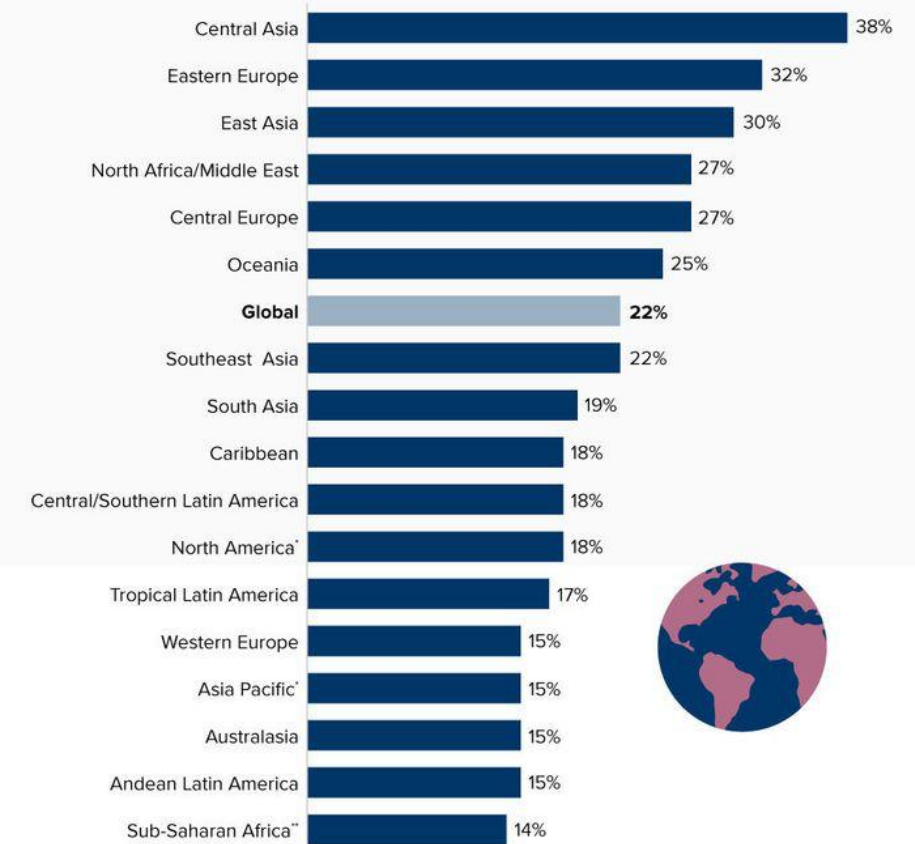
Leading Causes of Death: How Many Are Related to Food?

Cause of death (based on ICD-10)	Rank ¹	Deaths
All causes	...	2,543,279
✓ Diseases of heart (I00–I09,I11,I13,I20–I51)	1	599,711
✓ Malignant neoplasms (C00–C97)	2	582,623
✓ Chronic lower respiratory diseases (J40–J47)	3	143,489
✓ Cerebrovascular diseases (I60–I69)	4	128,546
Accidents (unintentional injuries) (V01–X59,Y85–Y86)	5	127,792
✓ Alzheimer's disease (G30)	6	83,637
✓ Diabetes mellitus (E10–E14)	7	73,932
Influenza and pneumonia (J09–J18)	8	50,636
✓ Nephritis, nephrotic syndrome and nephrosis (N00–N07,N17–N19,N25–N27)	9	45,622
Intentional self-harm (suicide) (*U03,X60–X84,Y87.0)	10	40,600

Leading Causes of Death in 2012;
National Vital Statistics Report, 2015

Poor diet causes 22% of global deaths

Share of adult deaths attributable to dietary risks in 2017, by region

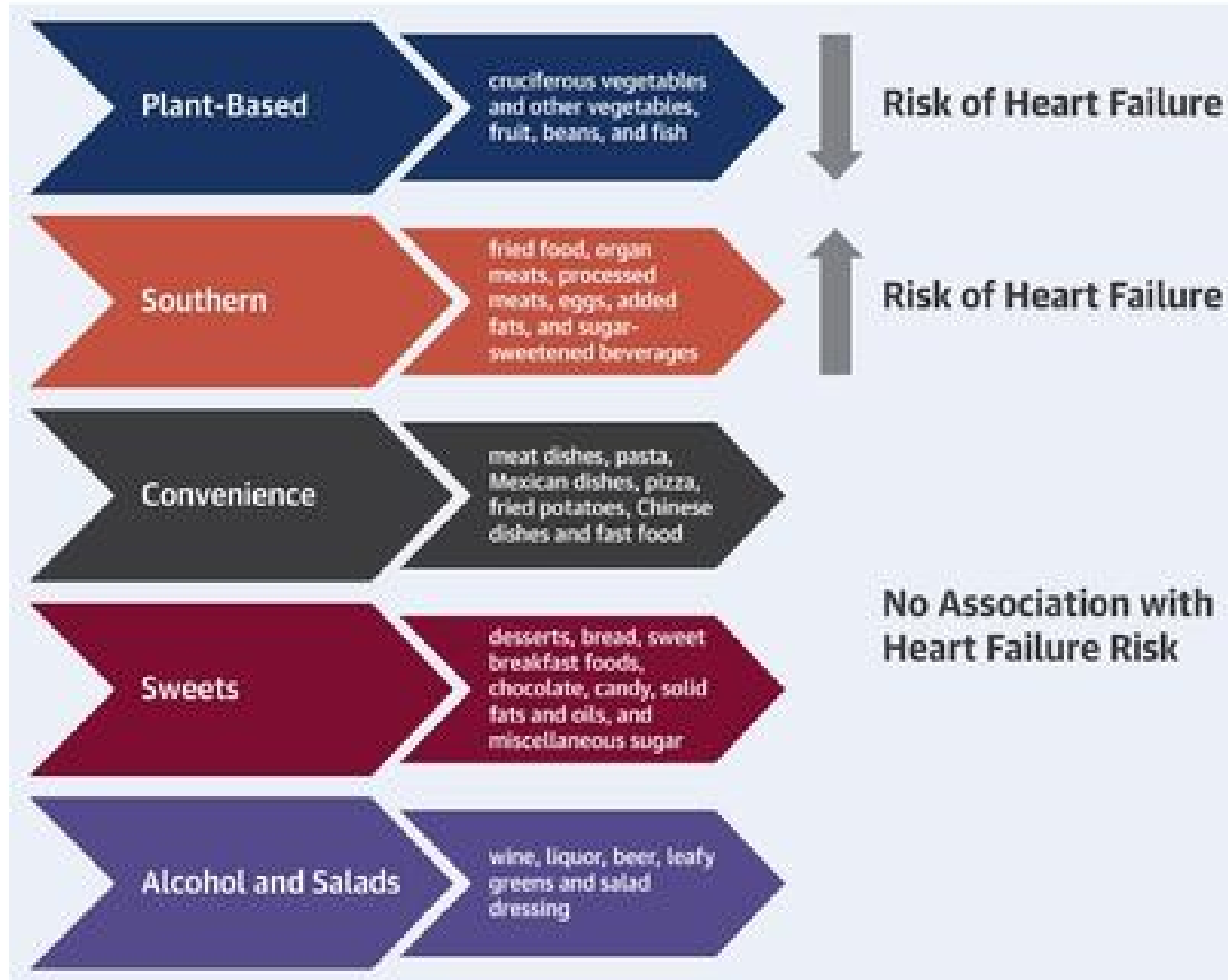


* High income

** Mean value of Central (15%), Eastern (14%), Western (13%) and Southern (13%).

Source: The Lancet

CENTRAL ILLUSTRATION: Dietary Patterns Among American Adults and Risk for Heart Failure



- Obesity
- Anorexia
- Type 2 diabetes mellitus
- Atherosclerosis
- Arterial hypertension
- Anemia
- Diseases of the thyroid gland
- Osteoporosis
- Malignant tumors
- Caries
- Food poisoning
- Allergy
- Parasitosis

Rational nutrition (lat. *rationalis* - smart)

- this is a type of nutrition that ensures the growth, normal development and vital activity of a person, contributing to the improvement of health and the prevention of diseases.

Principles of rational nutrition

1. Rule of energy adequacy of nutrition
2. Rule of nutritional (and plastic) adequacy of nutrition
3. Rule of enzymatic adequacy of nutrition
4. Rule of biotic adequacy of nutrition
5. Rule of biorhythmological adequacy of nutrition

1. Rule of energy adequacy of nutrition

The energy you spend = The cal you eat

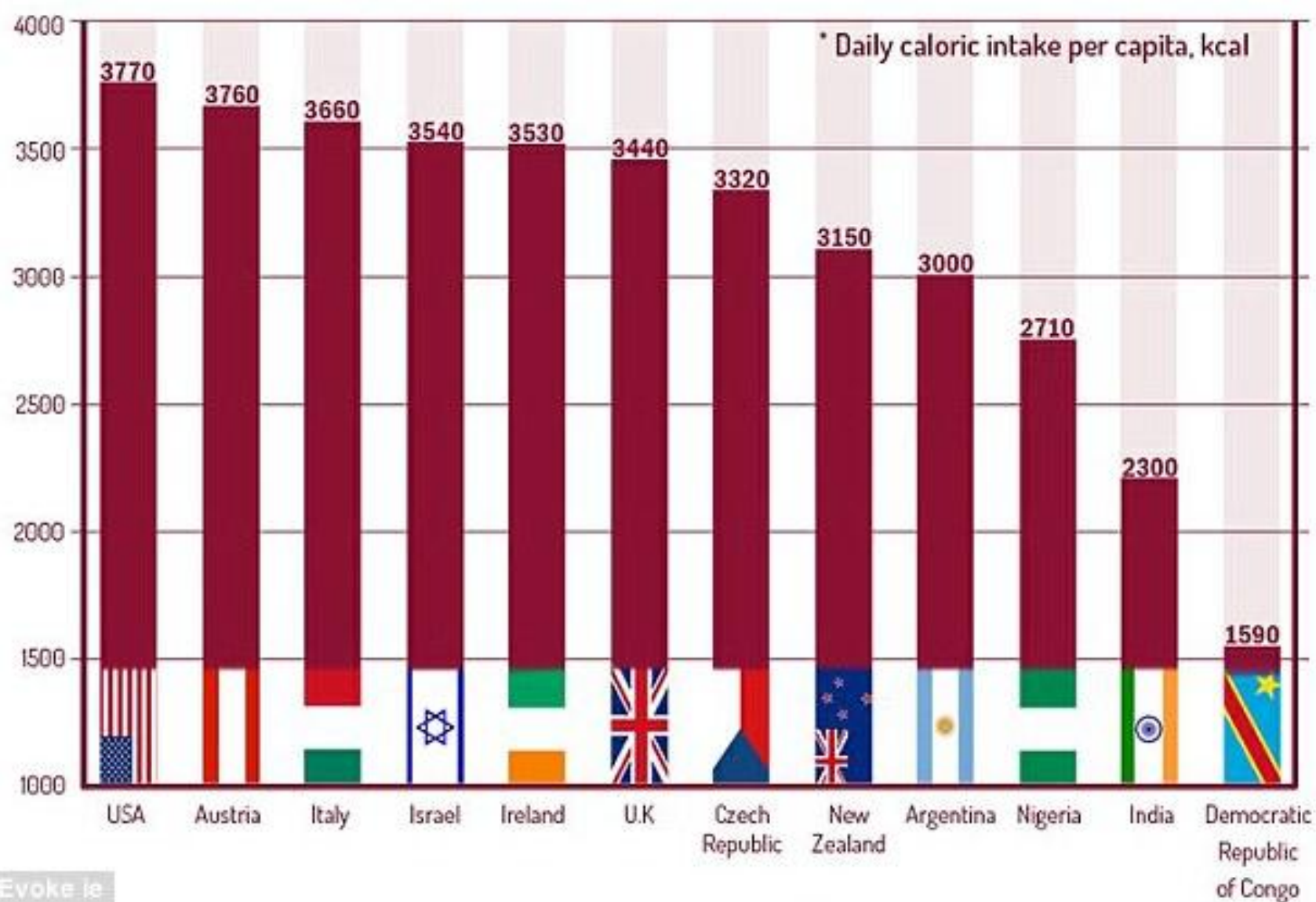
Physiological energy requirements for adults

from 2100 to 4200 kcal/day for men

from 1800 to 3050 kcal/day for women.

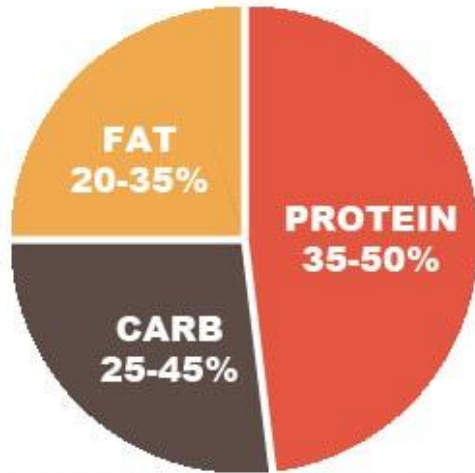


Daily Calorie Intake around the World



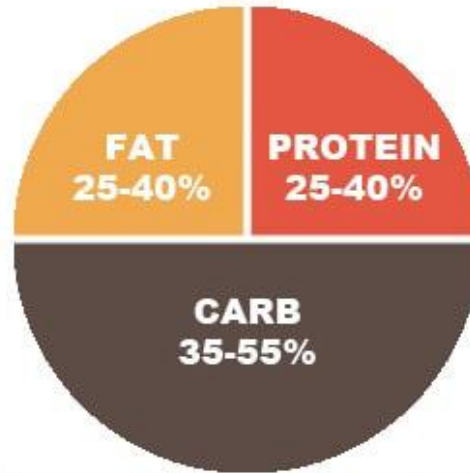
2. Rule of nutritional (and plastic) adequacy of nutrition

What Macronutrient Ratio Should I Use?



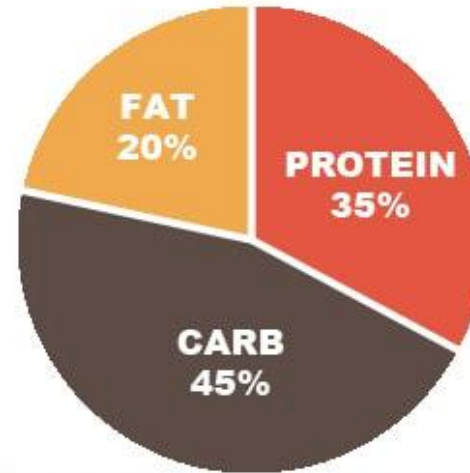
WEIGHT LOSS

HIGH PROTEIN
LOW CARB
LOW FAT



MAINTENANCE

MODERATE PROTEIN,
CARB, AND FAT



MUSCLE GAIN

HIGH PROTEIN
HIGH CARB
LOW FAT

3. Rule of enzymatic adequacy of nutrition

- Chemical composition of food, its digestibility and digestibility should correspond to the enzyme systems of the body



4. Rule of biotic adequacy of nutrition (safety)

- Food must be harmless and free of pathogenic microorganisms, as well as xenobiotics (pesticides, heavy metals, etc.)

10 FOODS THAT NATURALLY KILL PARASITES



Garlic



Onions



Pumpkin Seeds



Papaya Seeds



Coconut



Carrots



Sunflower
Seeds



Fermented
Foods



Raw
Honey



Berries

The main problems in global food safety are:

- the spread of microbiological hazards (including bacteria such as *Salmonella* or *Escherichia coli*);
- chemical pollutants of food products;
- evaluation of new food technologies (such as genetically modified foods)
- reliable food safety systems in many countries to ensure a safe global food chain.



Name	INS/E* number	ADI ^b
Alginic acid	400	NS
Sodium alginate	401	NS
Potassium alginate	402	NS
Ammonium alginate	403	NS
Calcium alginate	404	NS
Propylene glycol alginate	405	70 mg/kg
Agar	406	NL
Carrageenan	407	NS
Locust/carob bean gum (LBG)	410	NS
Guar gum	412	NS
Gum tragacanth	413	NS
Gum arabic	414	NS
Xanthan gum	415	NS
Karaya gum	416	NS
Tara gum	417	NS
Gellan gum	418	NS
Curdlan	424	NS
Konjac flour glucomannan	425	NS
Pectins (amidated and nonamidated)	440	NS
Cyclodextrin, alpha	457	NS
Cyclodextrin, gamma	458	NS
Cyclodextrin, beta	459	5 mg/kg
Powdered cellulose	460ii	NS
Methyl cellulose	461	NS
Ethyl cellulose	462	NS
Hydroxypropyl cellulose	463	NS
Hydroxypropyl methyl cellulose	464	NS
Methyl ethyl cellulose	465	NS
Sodium carboxymethyl cellulose	466	NS
Ethyl hydroxyethyl cellulose	467	NS
Cross-linked sodium carboxymethyl cellulose	468	NS
Sodium carboxymethyl cellulose, enzymatically hydrolyzed	469	NS
Beeswax, white and yellow	901	A
Candelilla wax	902	A
Carnauba wax	903	7 mg/kg
Shellac	904	A
Microcrystalline wax	905ci	20 mg/kg
Gum benzoic	906	ND
Polydextrose A and N	1,200	NS
Insoluble polyvinylpyrrolidone	1,202	NS
Dextrins, white and yellow roasted starch	1,400	NS

(continued)



5 Keys to Safer Food*

1

Keep clean



2

Separate raw and cooked



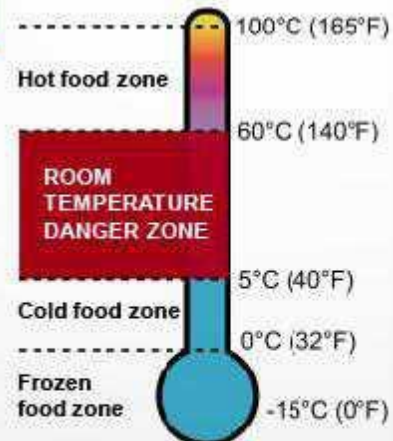
3

Cook thoroughly



4

Keep food at safe temperatures



5

Use safe water and raw materials



1. Keep clean

- Wash your hands before taking food and cooking
- Wash your hands after the toilet
- Wash and disinfect all surfaces and kitchen utensils used for cooking
- Protect the kitchen and food from insects, rodents and other animals

2. Separate raw and cooked food

- Separate raw meat, poultry and marine products from other food products
- To process raw foods, use separate kitchen appliances and accessories, such as knives and cutting boards.
- Store food in a closed container to prevent contact between raw and cooked products

3. Fry or boil the products well

- Thoroughly fry or boil foods, especially meat, poultry, eggs and marine products
- Bring dishes such as soups and roasts to a boil to be sure they have reached 70°C
- When cooking meat or poultry, their juices should be transparent, not pink.
- Thoroughly heat the cooked foods

4. Store the products at a safe temperature

- Do not leave cooked food at room temperature for more than 2 hours
- Cool all cooked and perishable food products without delay (preferably below 5°C)
- Keep cooked dishes hot (above 60°C) until serving
- Do not store food for a long time, even in the refrigerator
- Do not defrost food at room temperature

5. Choose fresh and not spoiled products

- Use clean water, or clean it
- Choose fresh and unspoiled products
- Choose products that have been processed in order to increase their safety, for example, pasteurized milk
- Wash fruits and vegetables, especially when they are served raw
- Do not consume expired products

5. Rule of biorhythmological adequacy of nutrition (regime)

- It is necessary to observe a rational diet in accordance with biological and social rhythms.

BREAKFAST



7:00 AM

AM SNACK



9:30 AM

LUNCH

@kids.eat.in.color



12:00 PM

PM SNACK



3:00 PM

DINNER



5:30 PM

BEDTIME SNACK



7:30 PM

Eating disorders

The three types of overeating

- Emotional eating: eating in response to emotional arousal states such as fear anger or anxiety.
- External eating: eating in response to external food cues such as sight and smell of food
- Restraint eating: overeating after a period of slimming when the cognitive resolve to diet is abandoned



The main reason - celebration table

Main reasons why we eat what we eat

INTERNAL

- Psychological
- Physiological (physical)
- Cultural
- Situational/social

EXTERNAL

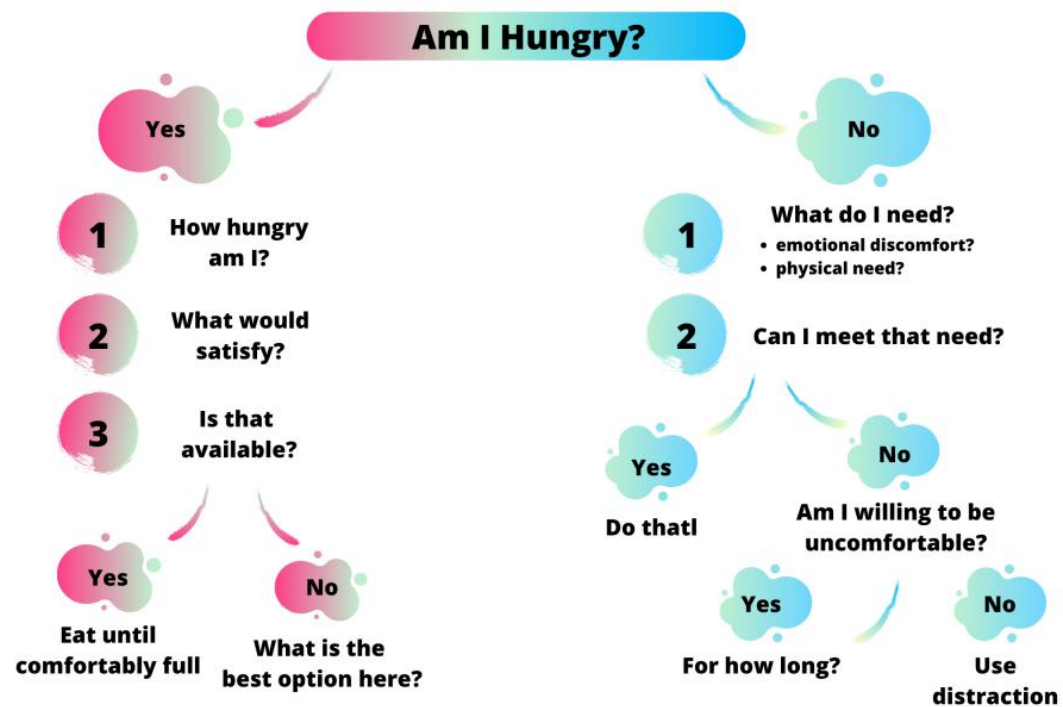
- Media
- Economy
- Environment
- Technology

EMOTIONAL HUNGER

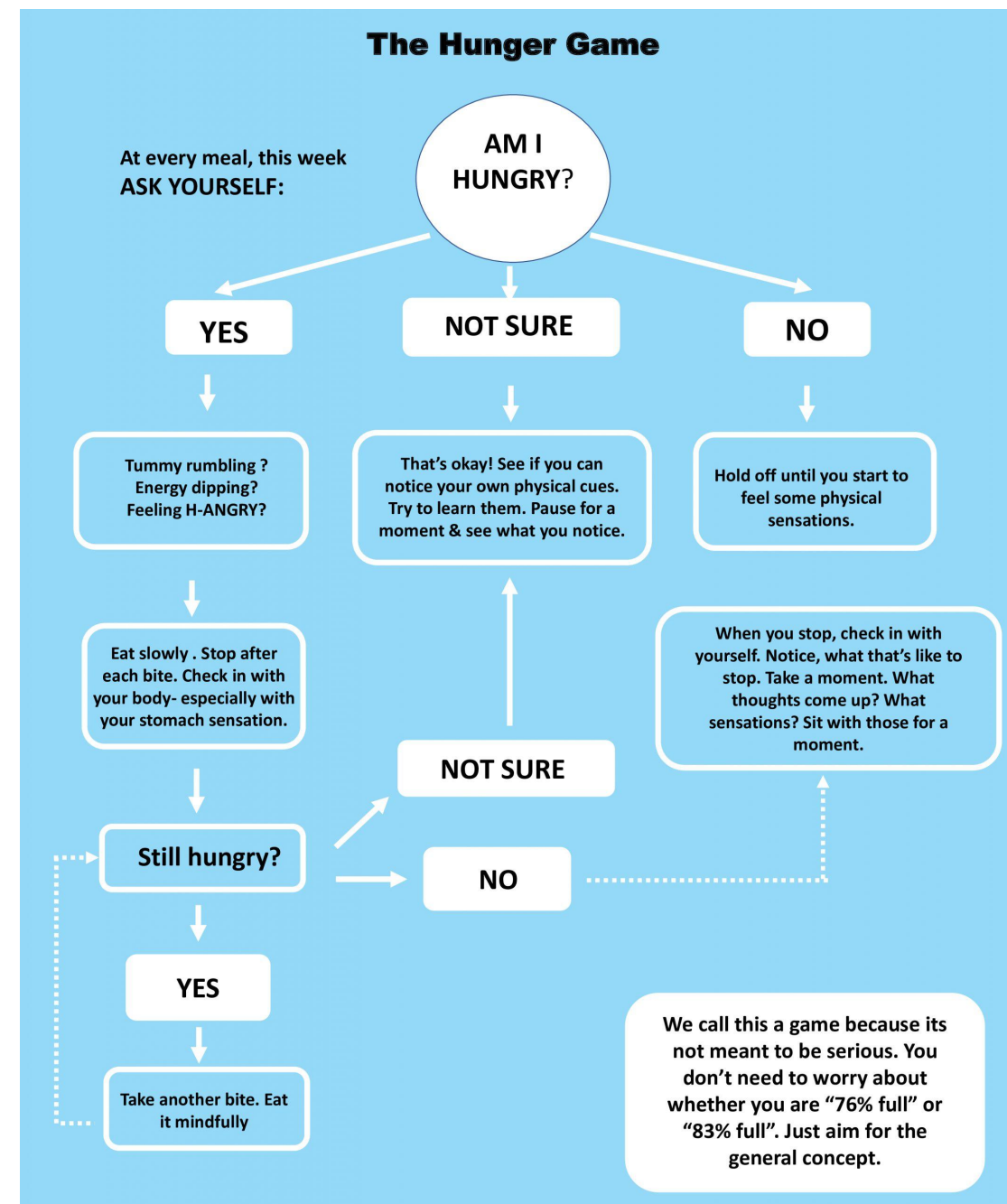
VS

PHYSICAL HUNGER

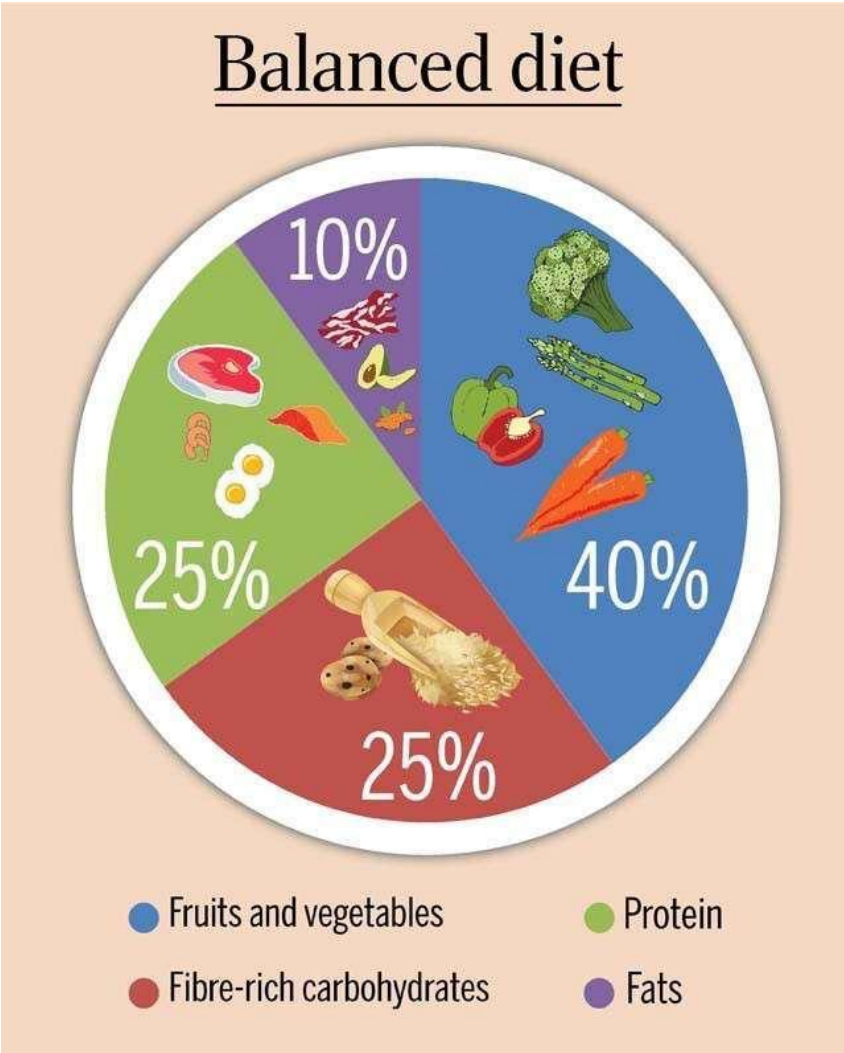
Starts suddenly.	Starts gradually.
Felt mostly in your head or on the surface of your thoughts.	Physically felt within your stomach.
A sharp craving that tends to be incessant.	A growling pang that tends to come in waves.
You become fixated on a specific food, taste, or texture.	You are open to many options, including less palatable foods.
Hard to satisfy, often leads to eating until uncomfortably full.	Easy to satisfy with a normal amount of food.
May trigger feelings of guilt, self-loathing, regret, or shame.	Doesn't make you feel bad about yourself.



Dr. Kerri Fullerton ND
Live Life. Love Food. Be Free



Balanced diet

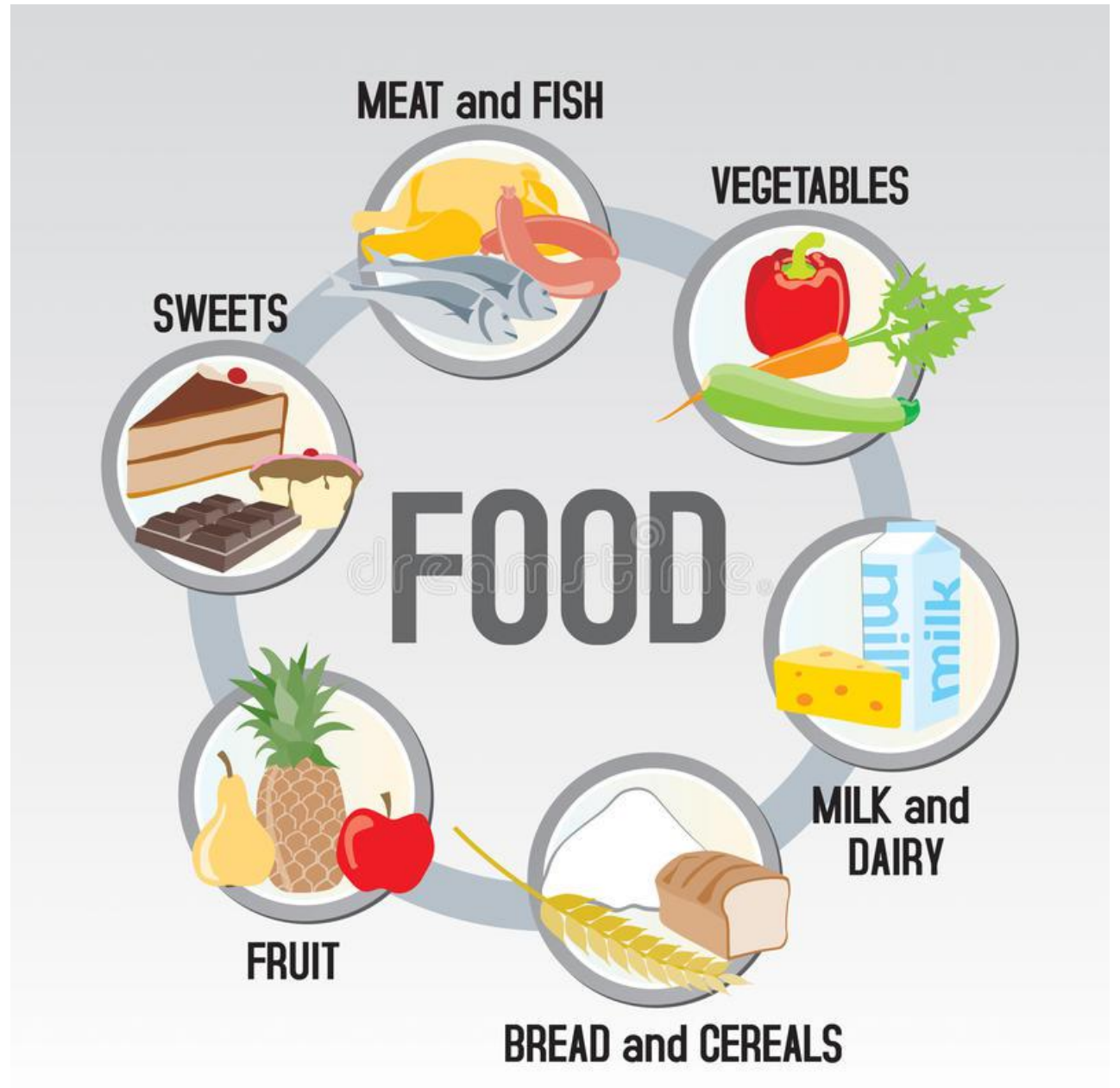


A balanced diet is a diet that contains differing kinds of foods in certain quantities and proportions so that the requirement for calories, proteins, minerals, vitamins and alternative nutrients is adequate and a small provision is reserved for additional nutrients to endure the short length of leanness.

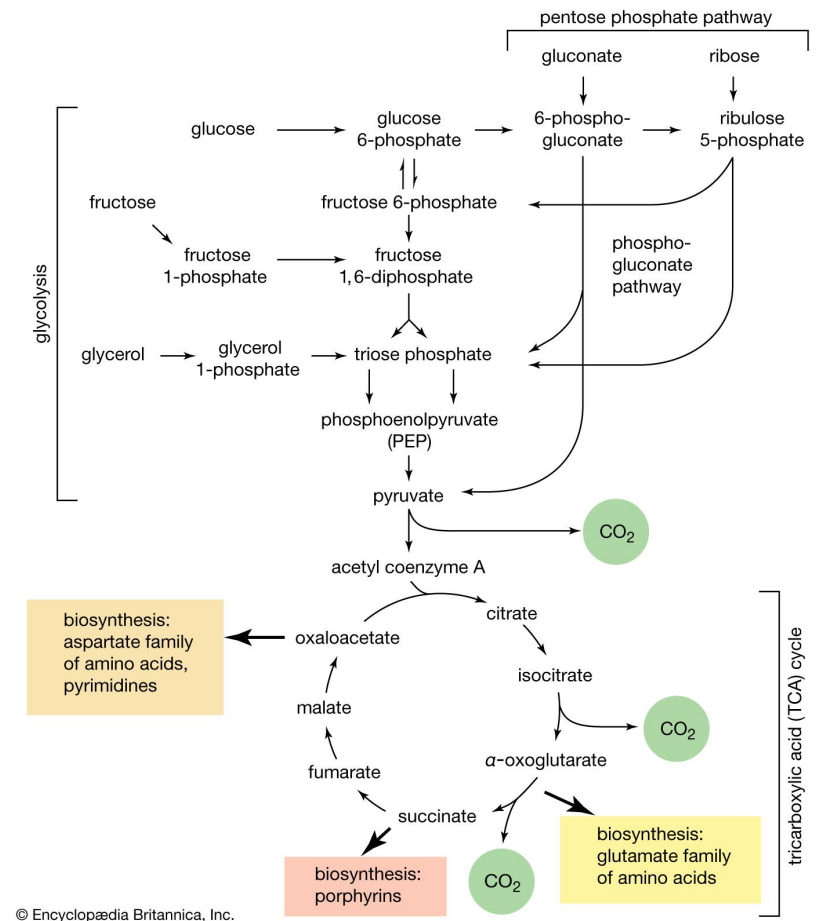
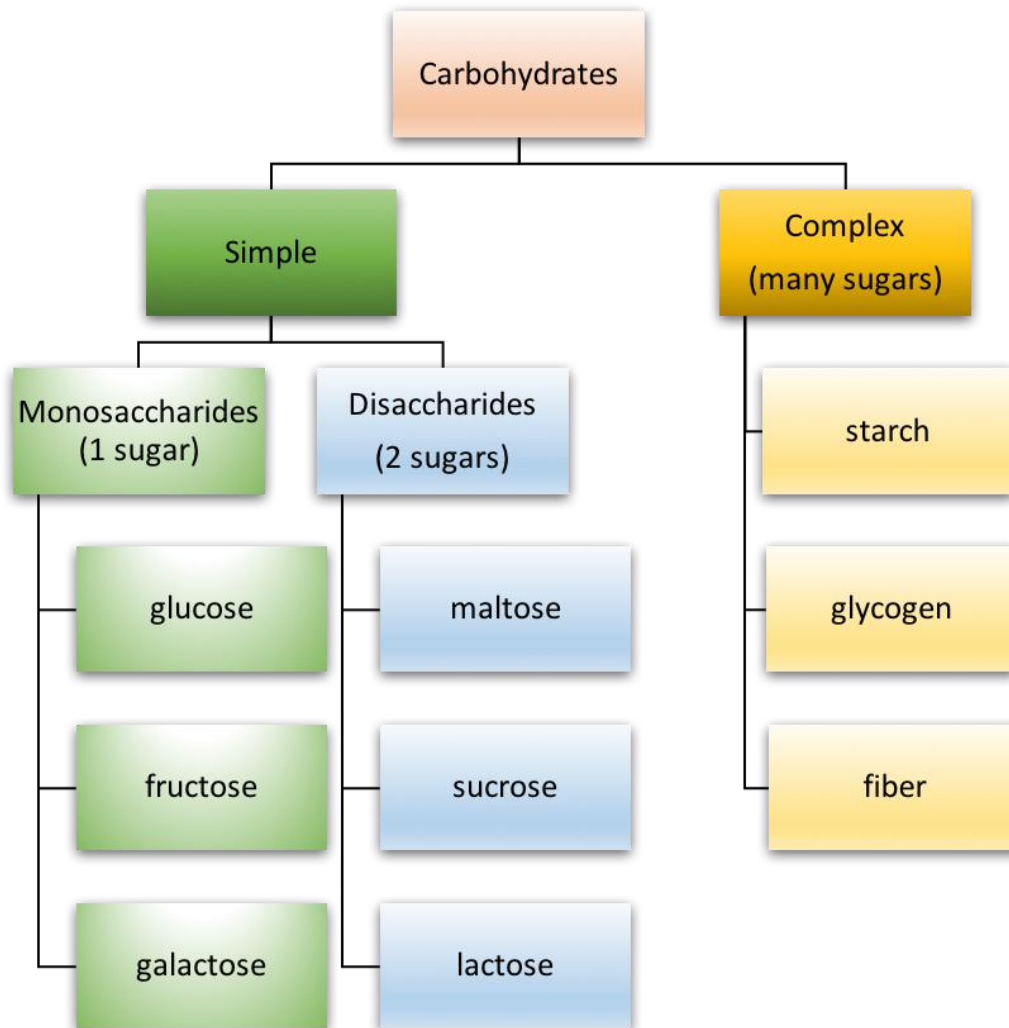
Vitamins	Diet		Units	% Increase
	Regular	Supplemented		
A	15.4	30.7	IU/g	100
Retinol	4.65	9.31	mg/kg	100
D3	1.54	2.05	IU/g	33
Cholecalciferol	38.39	51.18	g/kg	33
E	101	126	mg/kg	25
K3	51	102	mg/kg	100
B1	16.5	117.6	mg/kg	613
B2	14.9	27.2	mg/kg	83
Available niacin	41.2	87.3	mg/kg	112
B6	18.5	26.8	mg/kg	45
Pantothenic acid	33	141.6	mg/kg	329
B12	0.08	0.15	mg/kg	88
Available biotin	0.3	0.82	mg/kg	173
Folate	3.34	8.41	mg/kg	152

The data shown are vendor-reported values.

It is 6 necessary groups of food



Carbohydrates: 50-60% of the daily diet



1 g=4 kcal

Foods containing carbohydrates

Health Benefits of Carbohydrates

Energy for the Body

Uplifts Mood

Helps to Sleep Better

Provides Fiber to the Body

Helps to Prevent Diseases

Prevents Blood Clots

Useful to Control Weight

Improves the Digestive System

Helps to Keep Memory Sharp

Best Nutrient for Athletes



CARBOHYDRATES

STARCHY CARBS

Bread



Potatoes



Rice



Pulses



SUGARS

Natural Sugars

Free Sugars

Fruit sugar (fructose)



Table sugar (sucrose)



Honey



Milk sugar (lactose)



Biscuit



Unsweetened fruit juice



Digestible carbohydrates

Simple CHO

- i) glucose sugars naturally found in fruits and honey, cane sugar/ table sugar & milk sugar , added sugar in foods such as soft drinks and cakes



Complex CHO

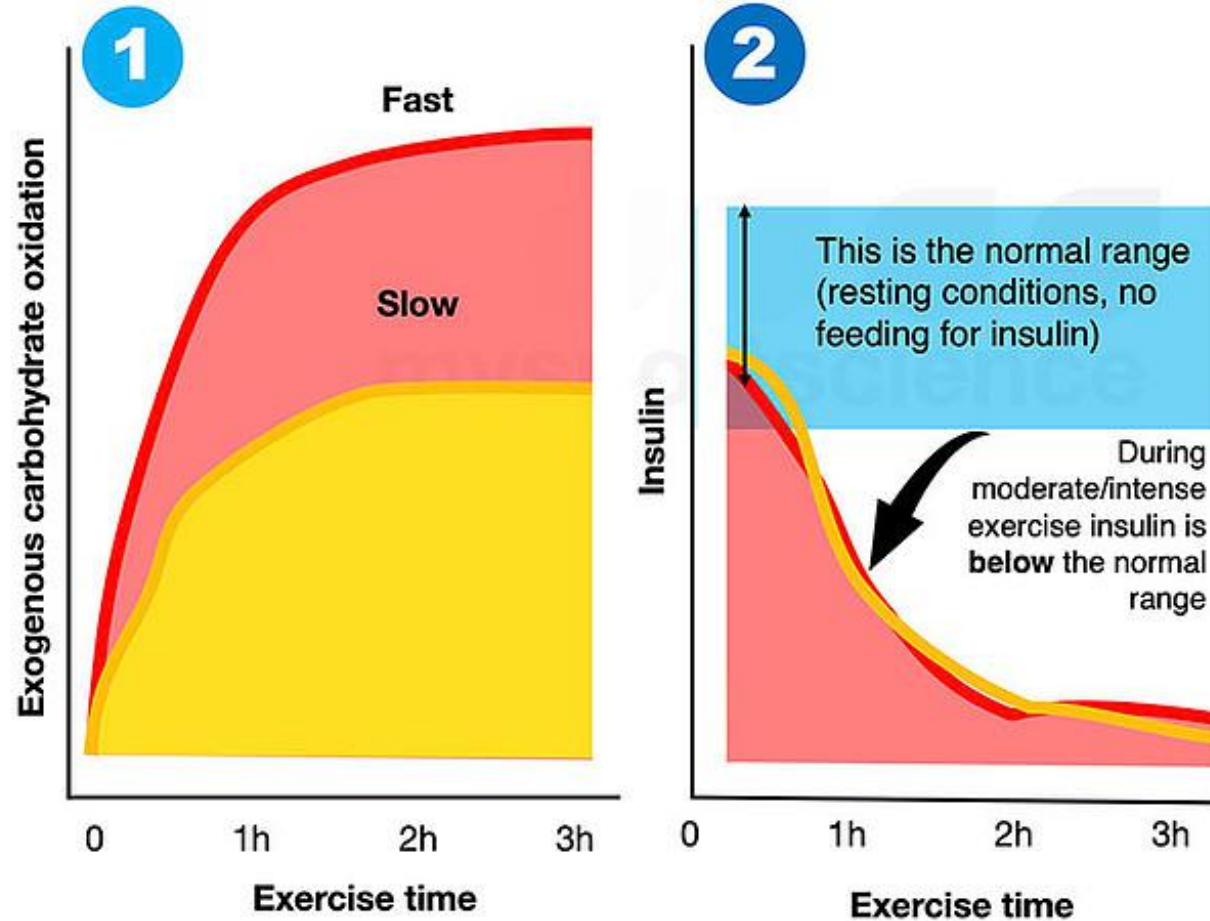
- i) Starches(eg: rice, oats, breads, potatoes, yam corn, peas, grains, cereal)



- ii) Fibers (mainly found in brown rice, wholegrain products, barley, fruits, most vegetables, oats)



Fast and slow carbs



Same amount of carbohydrate ingested: slow or fast carbohydrate

Most of the fast carbohydrate is oxidized

More of the slow carbohydrate remains in stomach or intestine

Increased risk of gastro-intestinal problems

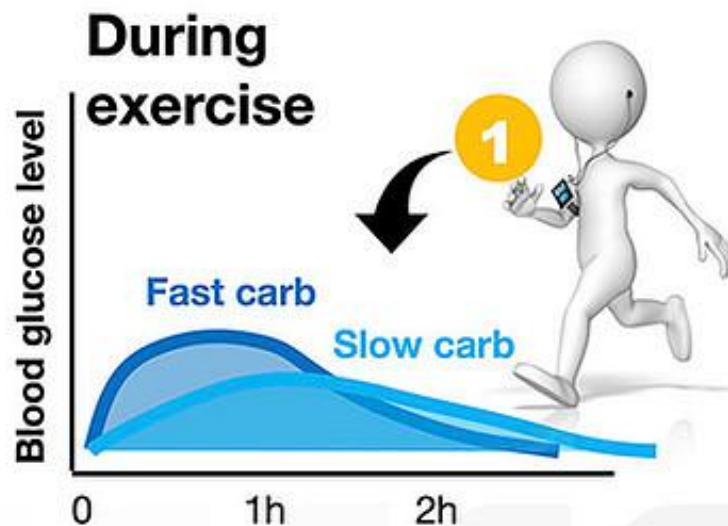
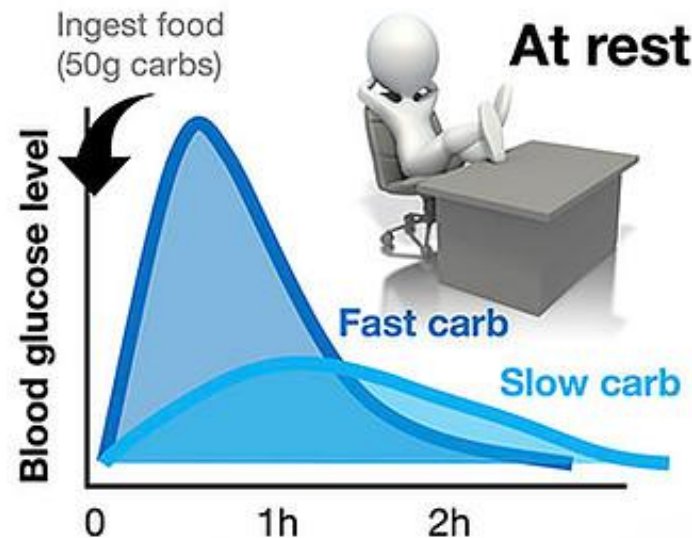
Exercise reduces insulin to **very** low levels even with carbohydrate feeding. There is **NO spike in insulin or blood glucose**

1

1

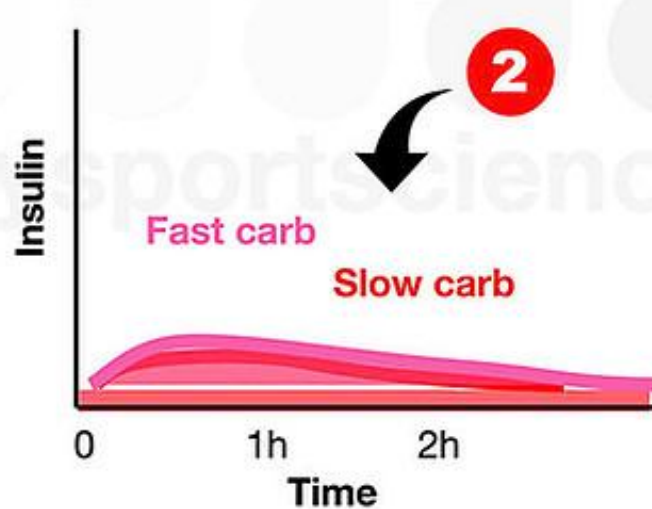
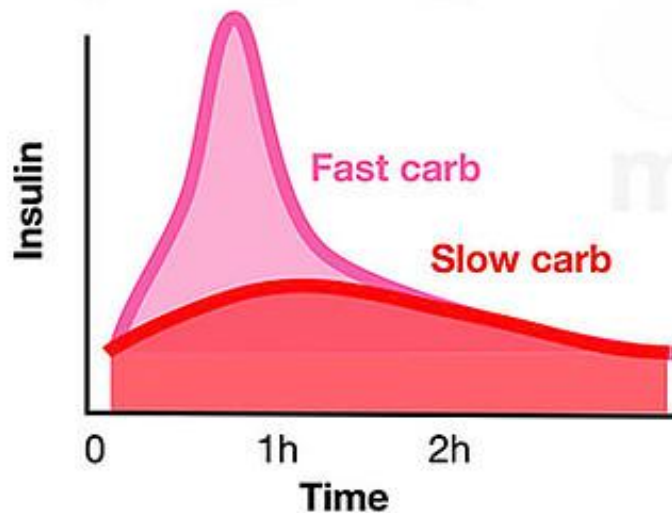
2

Slow versus fast carbs at rest and during exercise



1

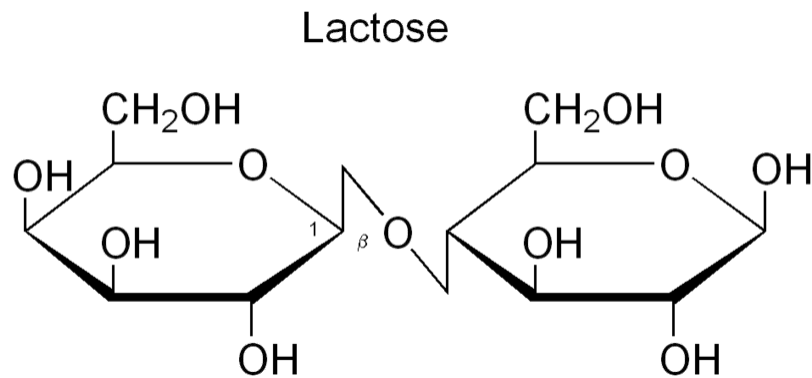
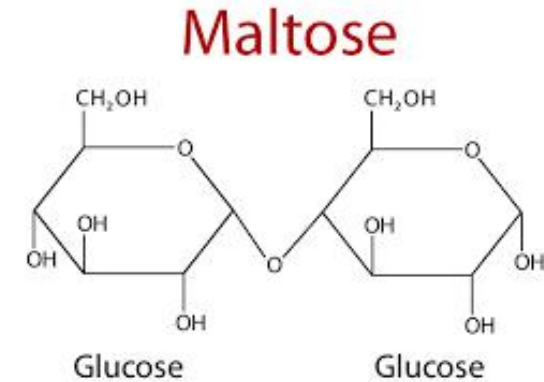
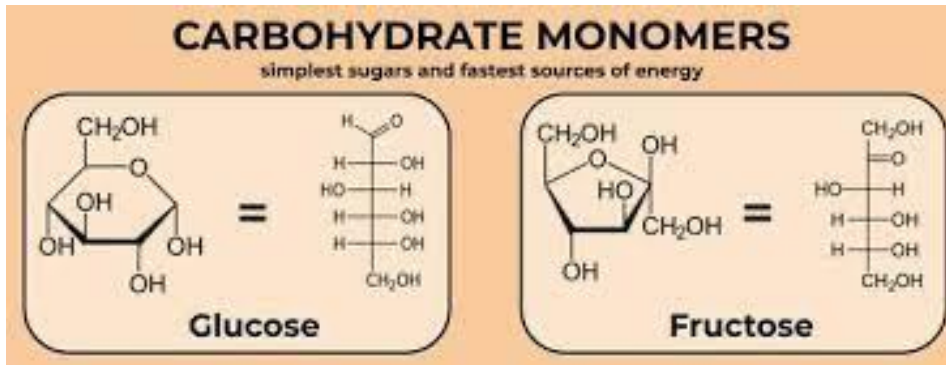
During exercise fluctuation in glucose are much smaller: there are no peaks and drops in glucose



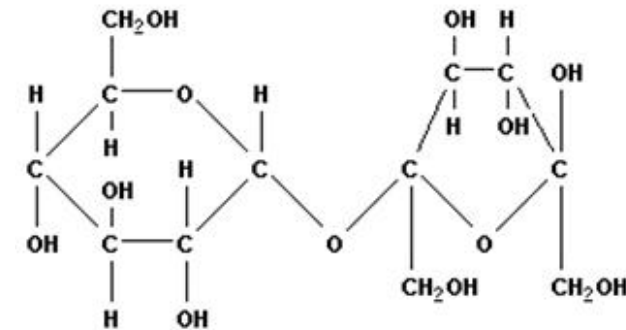
2

During exercise insulin is suppressed (and very low) regardless of the carbohydrate ingested

Types of quickly carbohydrates



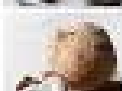
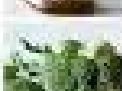
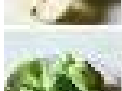
Saharose



Dietary fiber: 20-40 g per day

Long absence of dietary fiber in the diet can lead to a number of diseases that are somehow associated with a violation of the intestinal microflora.

- constipation
- irritable bowel syndrome
- gallstone disease
- colon cancer
- diabetes mellitus
- obesity
- atherosclerosis

HIGH-FIBER FOODS			
	SPLIT PEAS 1 cup cooked = 16g		LENTILS 1 cup cooked = 15g
	AVOCADO 1 medium = 13g		ARTICHOKE 1 cup = 22mg
	PEAS 1 cup cooked = 9g		BLACKBERRIES 1 cup = 8.5g
	RASPBERRIES 1 cup = 8g		COCONUT 1 cup = 7g
	PEAR 1 medium = 4.5g		BROCCOLI 1 cup cooked = 5g
	BRUSSELS SPROUTS 1 cup cooked = 4g		OATS 1 cup cooked = 4g
Recipes and Health Tips at the blender girl			

In order to consume the necessary amount of fiber, you need to eat:

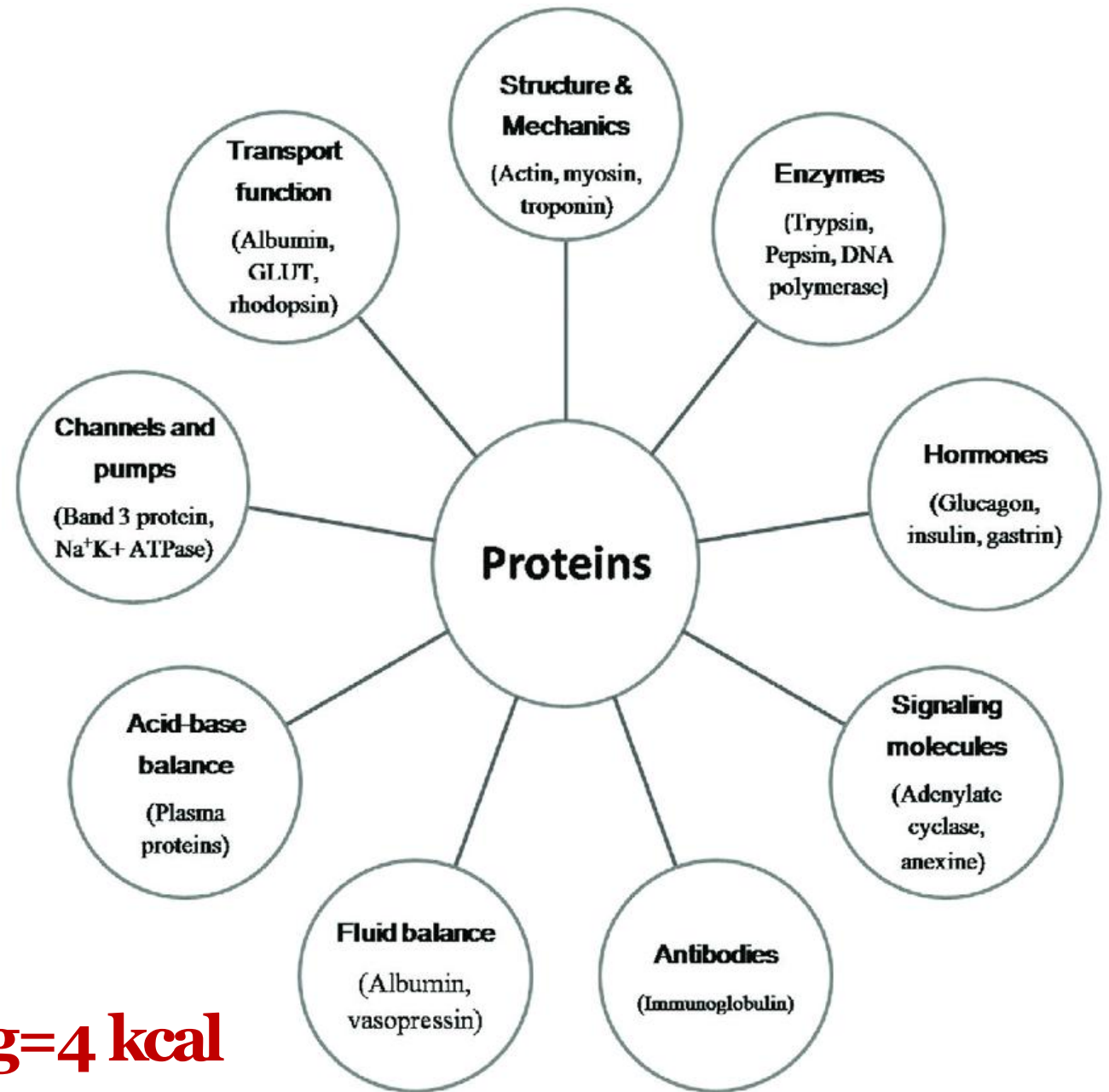
- at least 3 fruits per day;
- at least 3 servings (approximately 100 ml each) of vegetables per day;
- at least 4 servings of bread made from coarse flour, cereals, brown rice, oatmeal;
- several times a week, be sure to eat: beans, peas, corn or soy.



FRUITS	SERVINGS	GRAMS
Apricots	3 Medium	2.5
Raspberries	1 Cup	8.0
Pear	1 Medium	5.5
Apple	1 Medium	4.5
Banana	1 Medium	3.0
Orange	1 Medium	3.0
Strawberries	1 Cup	3.0
Pineapple	1 Cup	2.0
Honeydew Lemon	1 Cup (Pieces)	1.0
Mandarin Oranges	1/2 Cup	1.0
Nectarine	1 Medium	2.2
Peach	1 Medium	1.7
Plum	1 Medium	1.0
Prunes (dried)	10 Prunes	6.0
Raisins (seedless)	2/3 Cup	4.0
Tangerine	1 Medium	2.0
Watermelon	1 Cup (Pieces)	0.8
Kiwi	1 Each	2.5



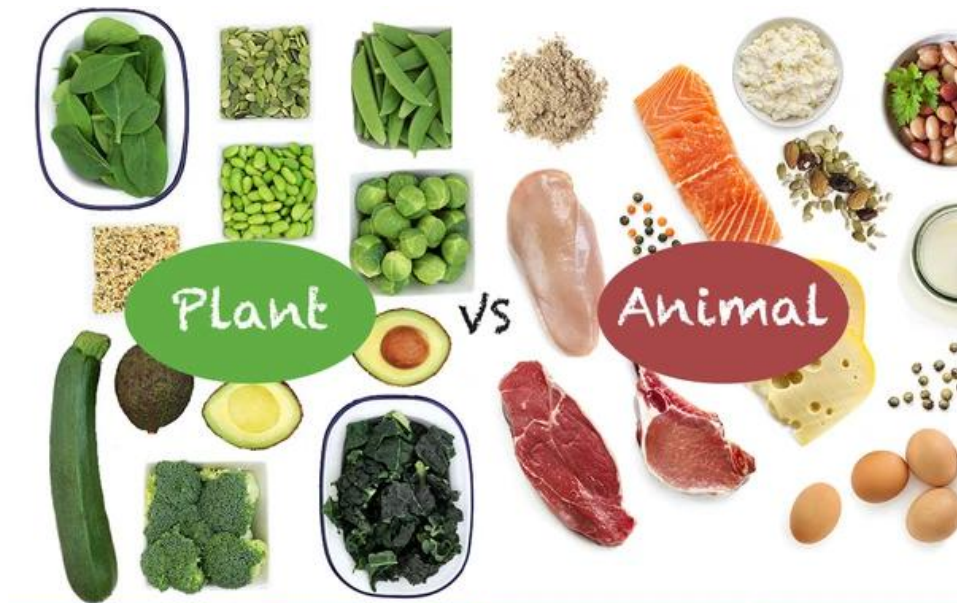
Proteins in the diet
15-20% 1 g per 1 kg of
body weight from 65
to 117 g/day for men,
from 58 to 87 g/day
for women



1 g=4 kcal

Animal or plant protein

Economic and sociological trends



Benefits

- Contains diverse minerals & phytonutrients
- Low fat content
- Higher in fiber & digestive enzymes
- No cholesterol

Benefits

- Contains all nine essential amino acids
- Contains creatine
- Higher in vitamin B12 & Iron
- More Protein



The environmental impact of animal protein

The livestock sector now produces

14.5%

of global GHG emissions.



Last year, the US National Oceanic and Atmospheric Administration announced the largest

'dead zone'

ever recorded in the Gulf of Mexico, caused by extensive soy and corn cultivation in the area to feed livestock farms.



On a per gram of protein basis, beef's water footprint is

6X

that of pulses, milk, eggs and poultry are around 1.5 x more.

Worldwide, more than

131,000 tonnes

of medically important antibiotics were used in farm animals in 2013. By 2030 it is estimated that India, China and US usage will increase by 82%, 59% and 22% respectively.

Growing market opportunity

In 2017, sales of plant-based alternatives to animal proteins rose

8.1%

on contrast to declining food sales in the same category.



In Germany,

1 in 10

consumers buy meat alternatives

Rising to

1 in 5

for Germans aged between 16 and 24.



Plant-based products, such as soy and almond milk, now make up

10%

of the overall dairy market.

30%

of millennials eat meat alternatives every day.

50%

eat meat alternatives a few times a week.

Plants foods such as beans, lentils, nuts, whole grains, and veggies provide a fantastic source of protein without the added drawbacks of meat.

PLANT PROTEIN

per serving

ADVANTAGES

- Fiber
- Phytonutrients
- Vitamins & minerals
- Low or healthy fat profile
- No cholesterol

18g
Red Lentils
boiled, 1 cup



17g
Edamame
boiled, 1 cup



15g
Black Beans
cooked, 1 cup



6g
Almonds
1 oz



5g
Peas
cooked, 1 cup



5g
Baked Potato
1 medium



5g
Spinach
boiled, 1 cup



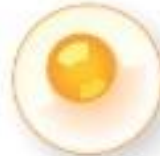
ANIMAL PROTEIN

per serving

DISADVANTAGES

- Cholesterol
- Saturated fat
- No fiber
- Higher in calories

6g
Egg
cooked, 1



20g
Salmon
cooked, 3 oz



25g
Steak
cooked, 3 oz



25g
Chicken
cooked, 3 oz



Eating minimally processed whole plant foods such as vegetables, fruits, whole-grains, legumes, and nuts lower the risk of diabetes, heart disease, cancer, and promote overall health.

Source: USDA Nutrient Analysis Database

Sources of animal protein (per 100g)

For adults, the recommended proportion of animal proteins from the total amount of proteins in the daily diet is 50%.

WHAT DOES **100g OF PROTEIN** LOOK LIKE?

cheatdaydesign.com

THE "FITSPO" WAY



1,160 Calories | 61g Fat
102g Carbs | 100g Protein
(Including 28g Total Fiber)

THE ANIMAL WAY



740 Calories | 29g Fat
12g Carbs | 100g Protein

THE PLANT WAY

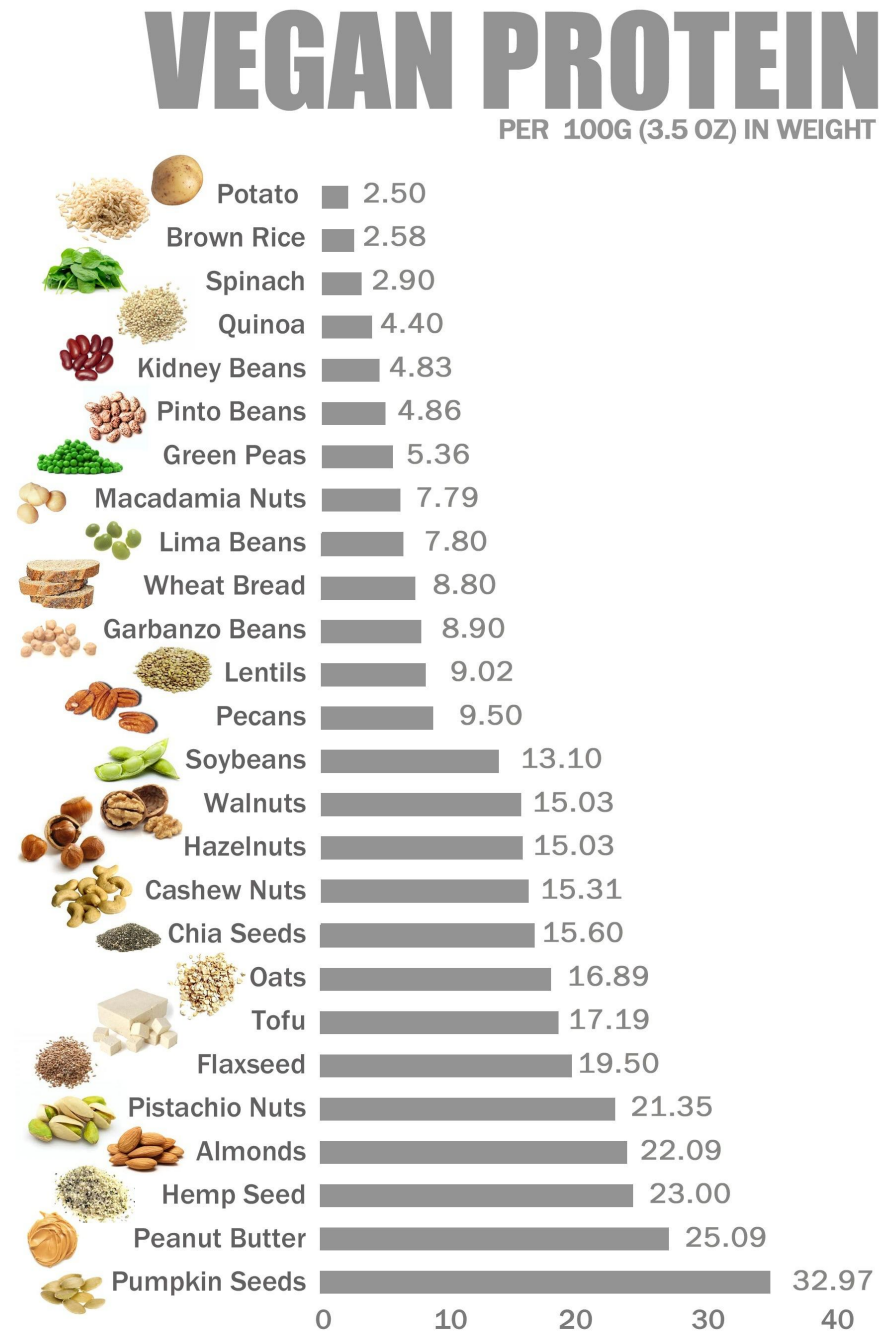


1,210 Calories | 36g Fat
138g Carbs | 100g Protein
(Including 46g Total Fiber)

THERE ARE NO **BEST** OR **CORRECT** WAYS TO GET YOUR PROTEIN IN.
CHOOSE WHICHEVER WAY OF EATING (OR ANY COMBINATION OF WAYS)
WORKS **FOR YOU.**

cheatdaydesign.com

Sources of vegetable protein (in 100 g)



Saturated fatty acids no more than 10% of the caloric content of the daily diet.

Polyunsaturated fatty acids 6-10 % of the caloric content of the daily diet

SATURATED FATS
VERSUS
UNSATURATED FATS
2 KEY DIFFERENCES

SATURATED FATS

Saturated Fats are a type of fats that have predominantly single bonds between molecules in the fatty acid chain

Solids at room temperature

Visit www.differencebetween.com

UNSATURATED FATS

Unsaturated Fats are a type of fats that have double bonds between molecules of the fatty acid chain

Liquids at room temperature

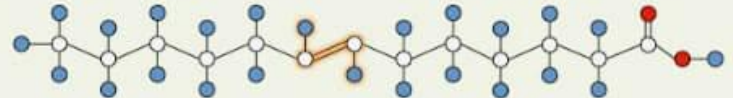
[Click here to go to main differences](#)

Differences Between Saturated and Unsaturated fatty acids

Saturated fatty acid
(**no** double bonds)



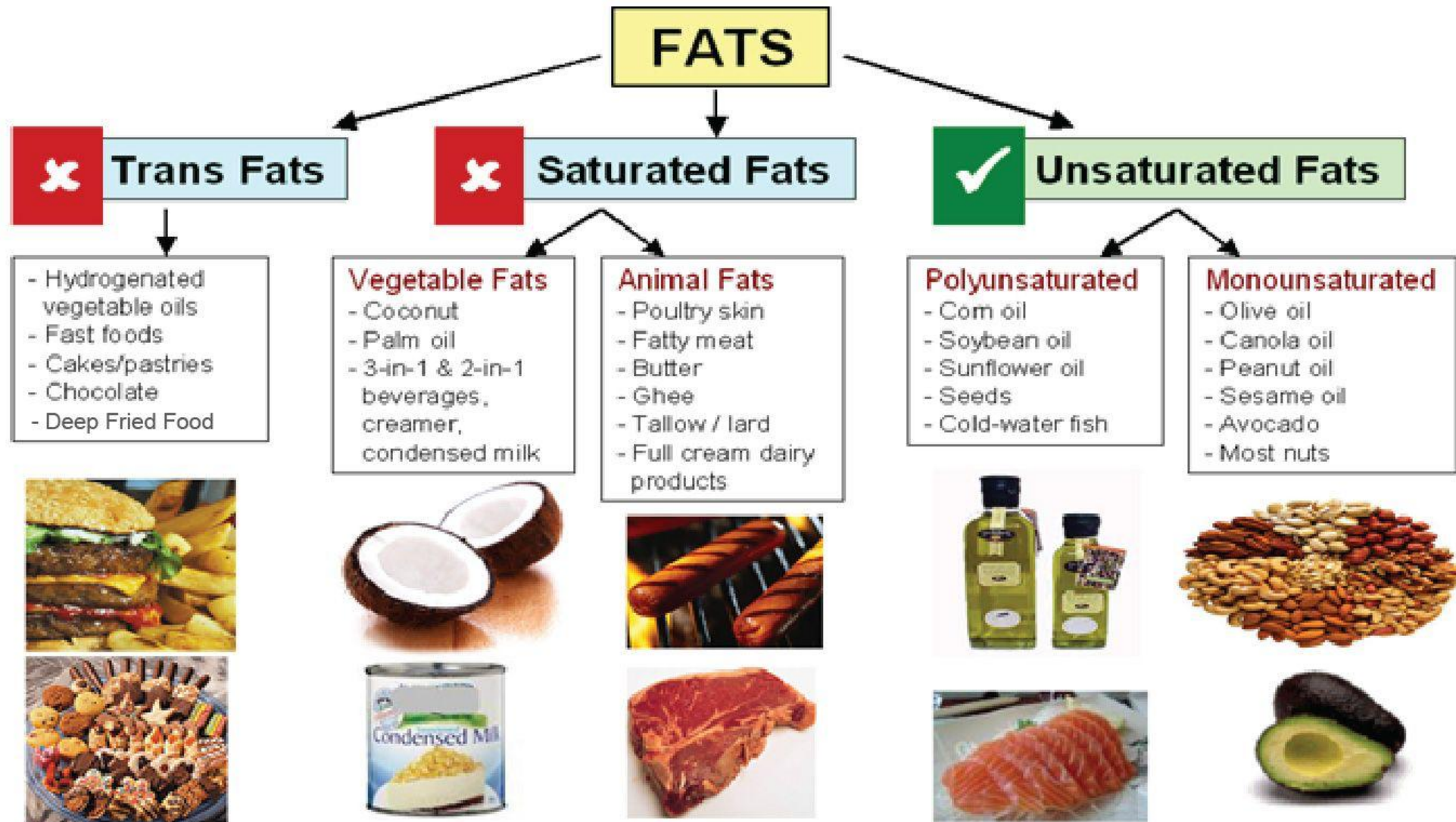
Unsaturated – **trans**
(H atoms opposite)



Unsaturated – **cis**
(H atoms same side)
⇒ **bent configuration**



○ = C ● = O ● = H



Functions of fats in the body

- Fats carry a lot of energy and are easy enough to store;
- Subcutaneous fat helps to keep a stable body temperature;
- Brown fat is directly involved in the production of heat;
- The fat layer protects from injury (it is much more painful for a person with an insufficient percentage of fat in the body to hit) and protects internal organs;
- Many hormones consist of fats, including sex hormones. That is why, as a consequence of low-calorie or fat-free diet, the ability to conceive, sexual desire and the ability to enjoy sex disappear;
- The brain and nervous tissue contain quite a lot of fat. Fats are necessary for adequate renewal of nerve tissues;
- [The immune](#) system also needs a sufficient amount of fat. Some fatty acids are involved in the regulation of inflammatory reactions, accelerate the processes of recovery and regeneration, and are antioxidants;
- The health of the joints strongly depends on the intake of fats. Lack of fat dramatically increases the probability of injury;
- Hair, nails and skin also suffer from a lack of fats;
- Some vitamins are absorbed by us only in the presence of fats. They are not synthesized in the body (vitamins A and E);
- Lecithin, which is necessary for the construction of cell membranes, has a fatty origin
- Fats are involved in the activation of blood clotting
- The bile involved in the digestion of fats contains lipids

Cholesterol 300 mg/day

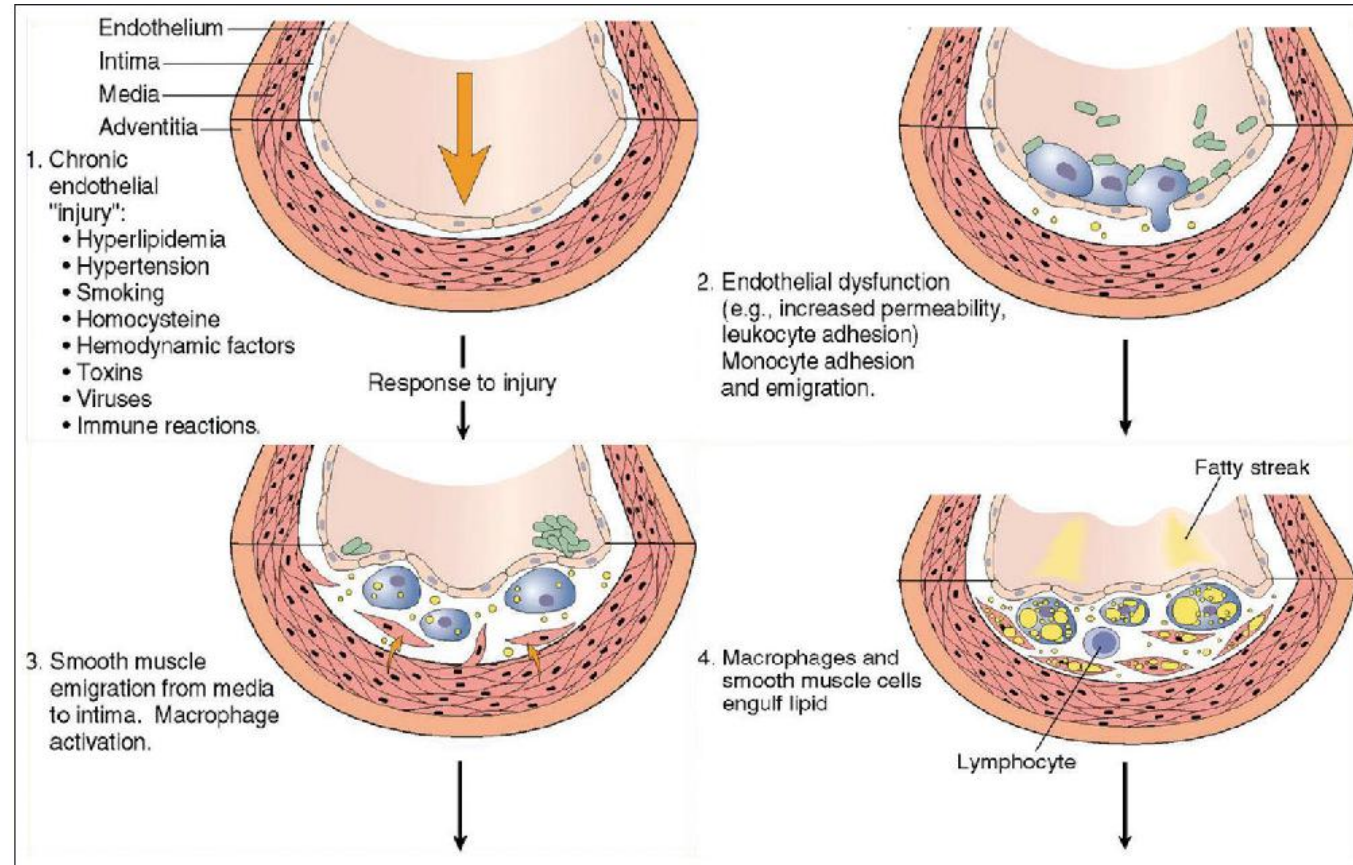
- plasma membrane flow stabilizer
- participates in the biosynthesis of steroid sex hormones and corticosteroids
- it serves as the basis for the formation of bile acids and group D vitamins
- participates in the regulation of cell permeability and protects red blood cells from hemolytic poisons
- forms the sheaths of nerve fibers
- necessary for the normal functioning of the immune system

Top 10 Foods Highest in Cholesterol

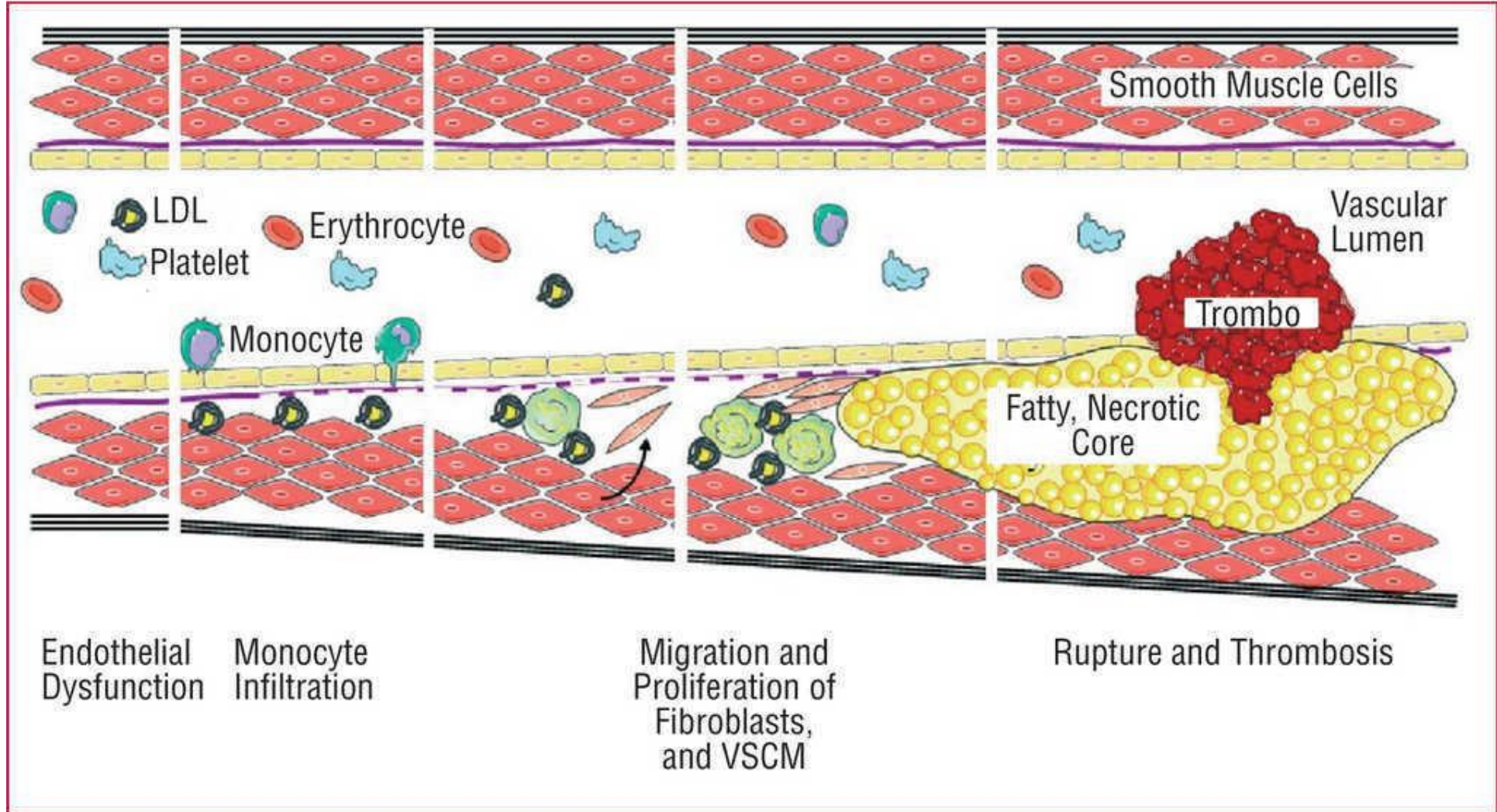
300mg of Cholesterol = 100% of the Daily Value (%DV)

1 Fast Foods (McDonalds Big Breakfast)  155% DV (465mg) per order 767 calories	2 Liver  140% DV (419mg) per 3oz serving 202 calories
3 Fatty Meats (Chicken Leg)  109% DV (328mg) per roasted leg (thigh and leg) 475 calories	4 Canned Shrimp  108% DV (323mg) per cup 128 calories
5 Desserts (Chocolate Mousse)  94% DV (283mg) per 1/2 cup 455 calories	6 Eggs  62% DV (187mg) in 1 large egg 78 calories
7 Whipped Cream  44% DV (133mg) per cup whipped 350 calories	8 Bacon  12% DV (36mg) per 3 slices 168 calories
9 Cheese  12% DV (35mg) per oz 100 calories	10 Butter  10% DV (31mg) per tblsp 102 calories

Atherosclerosis



es of fatty streaks formation



Benefits of omega 3 fatty acids



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IMAGE ID: 1473687164
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10

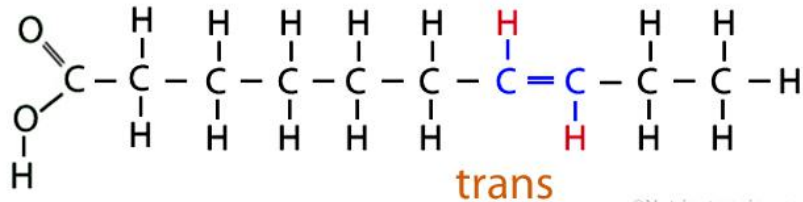
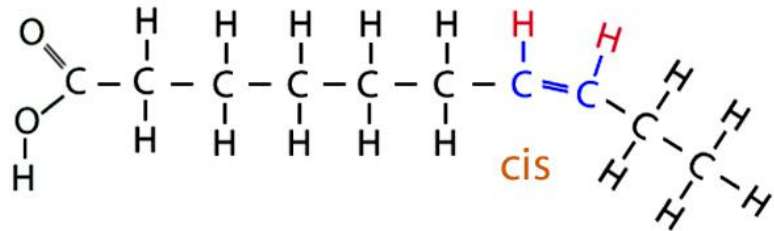
Health Benefits of Omega 3's



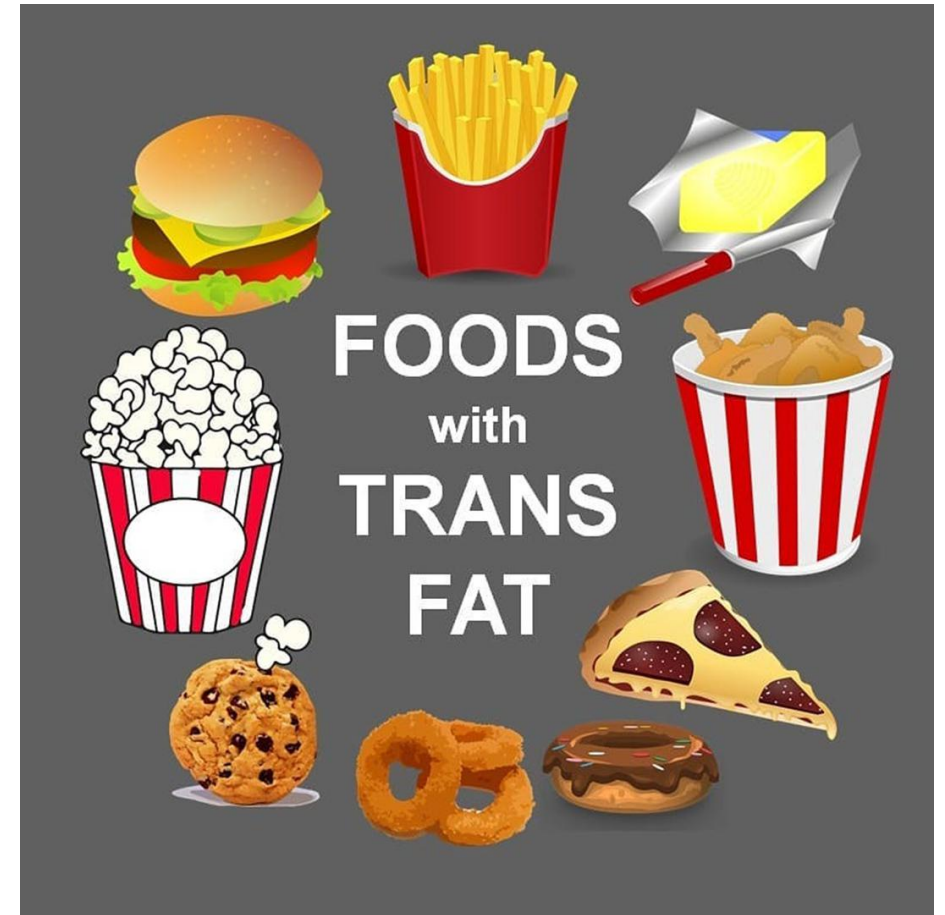
Trans fats

are obtained by attaching hydrogen atoms to unsaturated double bonds in vegetable oil molecules. This process is called hydrogenation

Cis- and Trans-Fatty Acids

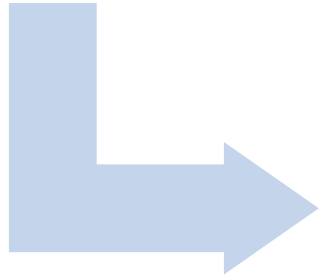


©Nutrientsreview.com



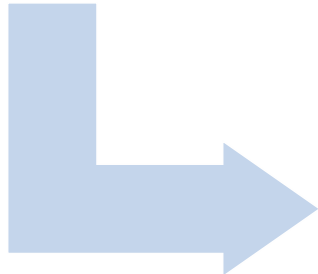
Non-
balanced
diet

- Brake all rules of healthy diet: eat too much carbohydrates and fats: brake the regime and so on



Obesity

- Having Body Mass Index more then 30



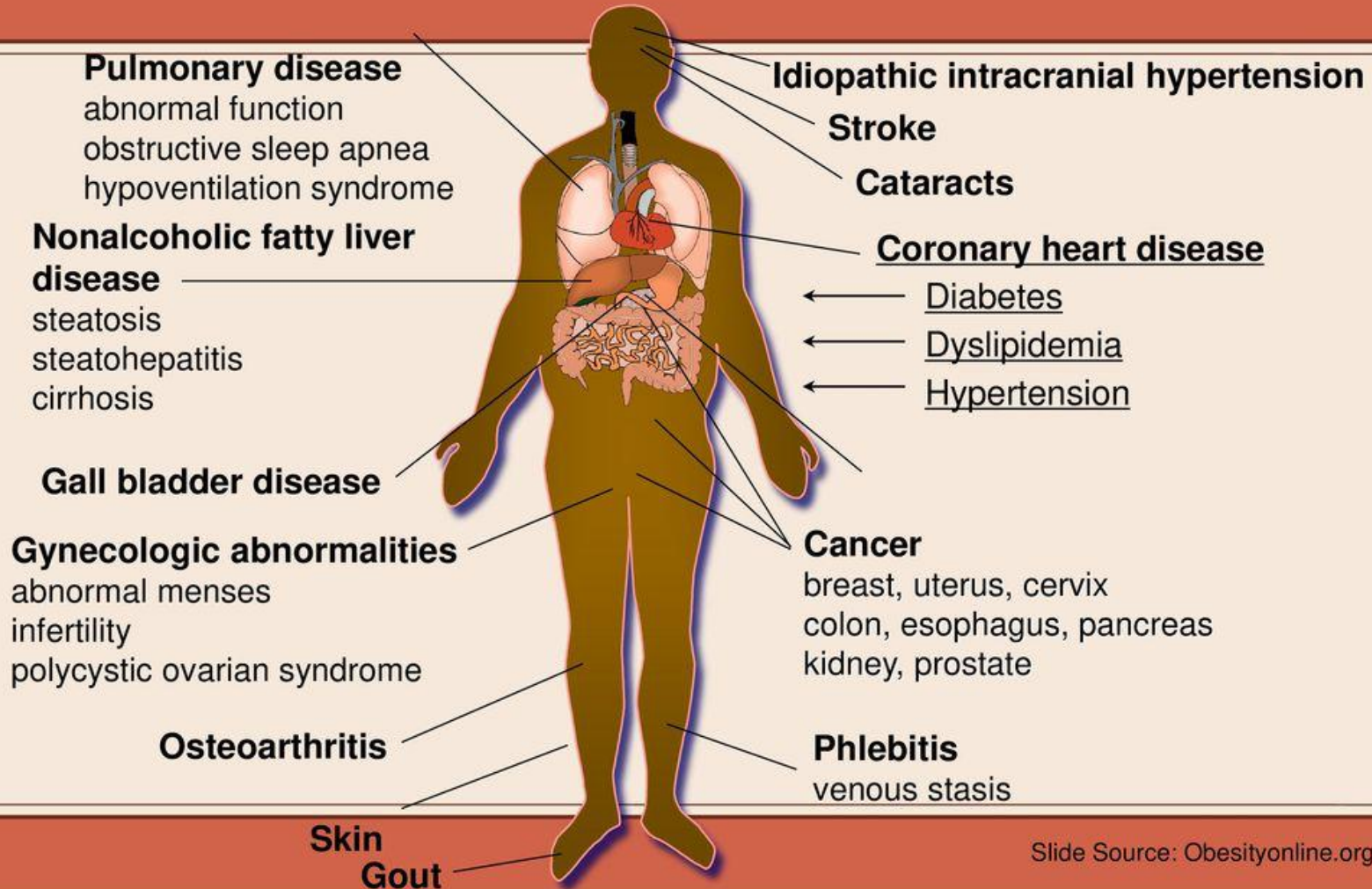
Earlier death

- AS A
RESULT

Conclusion

Or obesity is just a normal situation in a modern life with all new techniques for making our life more comfortable?

Medical Consequences of Obesity



Thank you for attention

French Fries
Calories | 460

 **WALK**
90 minutes

 **RUN**
50 minutes



ЛИТЕРАТУРА

Основная

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2. Здоровый образ жизни и профилактика заболеваний : учеб. пособие М. А. Морозов СПб Спец. лит., 2012.

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5. Экология человека [Электронный ресурс] : курс лекций. - Режим доступа: <http://ibooks.ru/reading.php?productid=340176> И. О. Лысенко, В. П. Толоконников, А. А. Коровин [и др.] Ставрополь : СтГАУ, 2013.

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2. Здоровая России Интернет-ресурс <http://www.takzdorovo.ru/>
3. Калькулятор калорий Интернет-ресурс <http://www.calorizator.ru/>