

Nutrition

The basis of healthy living

**And the earth has He
appointed for His creatures.
Wherein are fruit and
sheathed palm trees. Husked
grain and scented herb.
Which is it of the favors of
your Lord that you deny?**

Al Rehman (Al Quran)

Goals

- How is our biochemical energy generated?
- What roles do carbohydrates, fats and proteins play in our diets and health?
- What are the major functions of vitamins and minerals in our diet?
- What are current recommendations for a healthy diet?
- What are the types and functions of food additives?
- How we use energy?
- How is body weight regulated?
- What drives the metabolism during fasting?
- What is the relationship between diet and heart disease?
- How can we modify the diet of diabetic and hypertensive patients?
- What are the nutritional requirements in pregnancy, lactation and in the newborn?
- What is Protein Energy Malnutrition?



The science that deals with diet and health

NUTRITION



Nutrition

- Nutrients

Substance in the food that provides energy or biochemical raw material

- Macronutrients
- Micronutrients

- Five classes of nutrients

- Proteins
- Fats
- Carbohydrates
- Vitamins
- Minerals

- Water

Lecture contents

- Balanced diet
- DRIs or Dietary Reference Intakes
- Acceptable Macronutrient Distribution Ranges
- Major food groups
- Beverages

A balanced diet is one that contains all the five types of dietary ingredients, i.e. proteins, fats, carbohydrates, vitamins and minerals in amounts sufficient for the particular individual depending upon his age, sex and level of activity etc.

BALANCED DIET

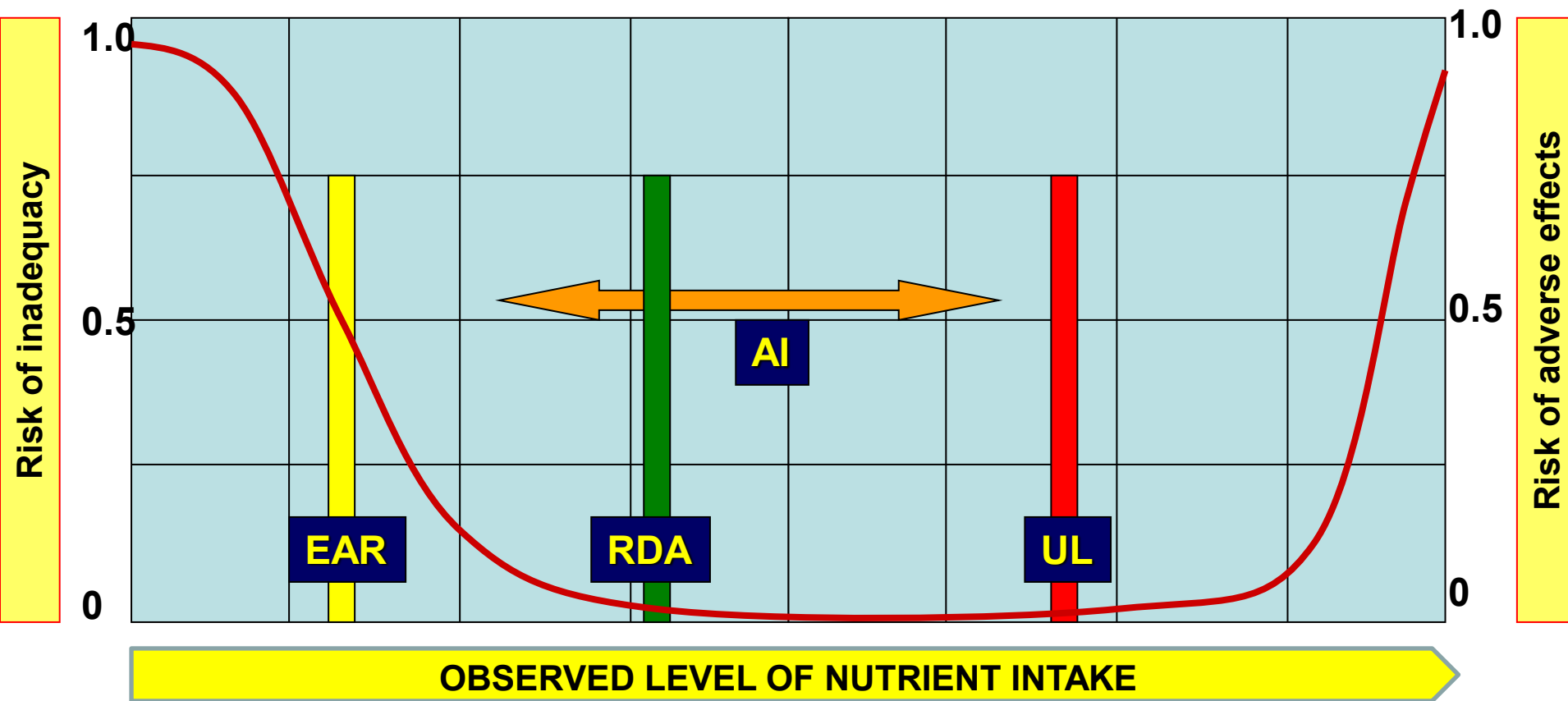
Those who, when they spend are not extravagant and not niggardly, but hold a just (balance) between these two (extremes).

67- Al-Furqân (Al Quran)

DRI or Dietary Reference Intakes

- EAR Estimated Average Requirement
 - Intake at which the risk of inadequacy is 50%
- RDA Recommended Dietary Allowance
 - Intake at which the risk of inadequacy is 2-3%
- AI Adequate Intake
 - Estimate of nutrient intake of healthy people
- UL Tolerable Upper Intake Level
 - At an intake above UL the risk of adverse effects increases

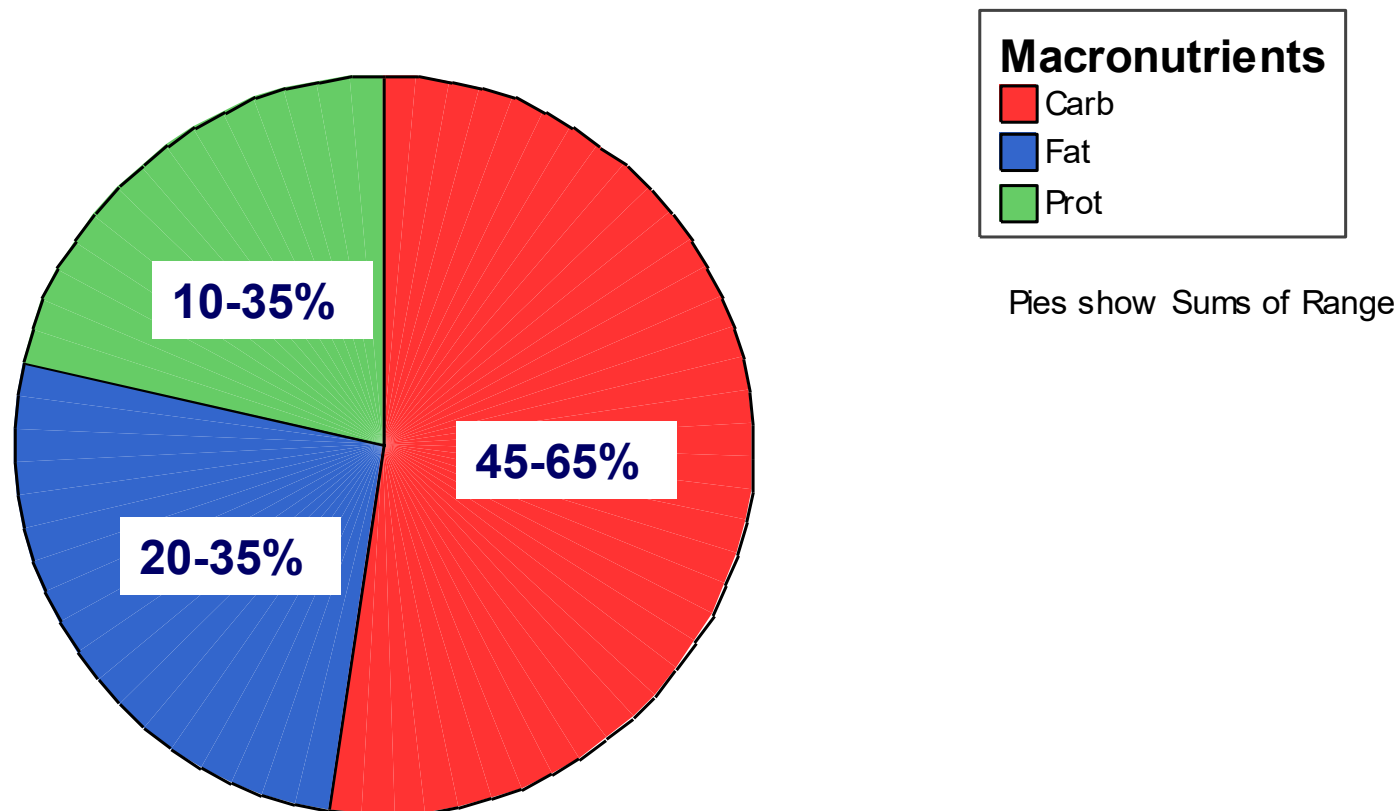
COMPARISON OF COMPONENTS OF DRIs



Acceptable Macronutrient Distribution Ranges

- AMDR
- “A range of intakes for a particular macronutrient that is associated with reduced risk of chronic disease, while providing adequate amounts of essential nutrients.”

AMDR



- Importance of protein in diet
- Protein turnover
- Nitrogen balance
- Nutritionally essential amino acids
- Protein quality
- Requirement of protein in diet

PROTEINS



Membrane proteins

Contractile proteins

**Structural
Proteins**

Transport proteins

Importance of protein in diet

Creatine

Enzymes

Hemoglobin

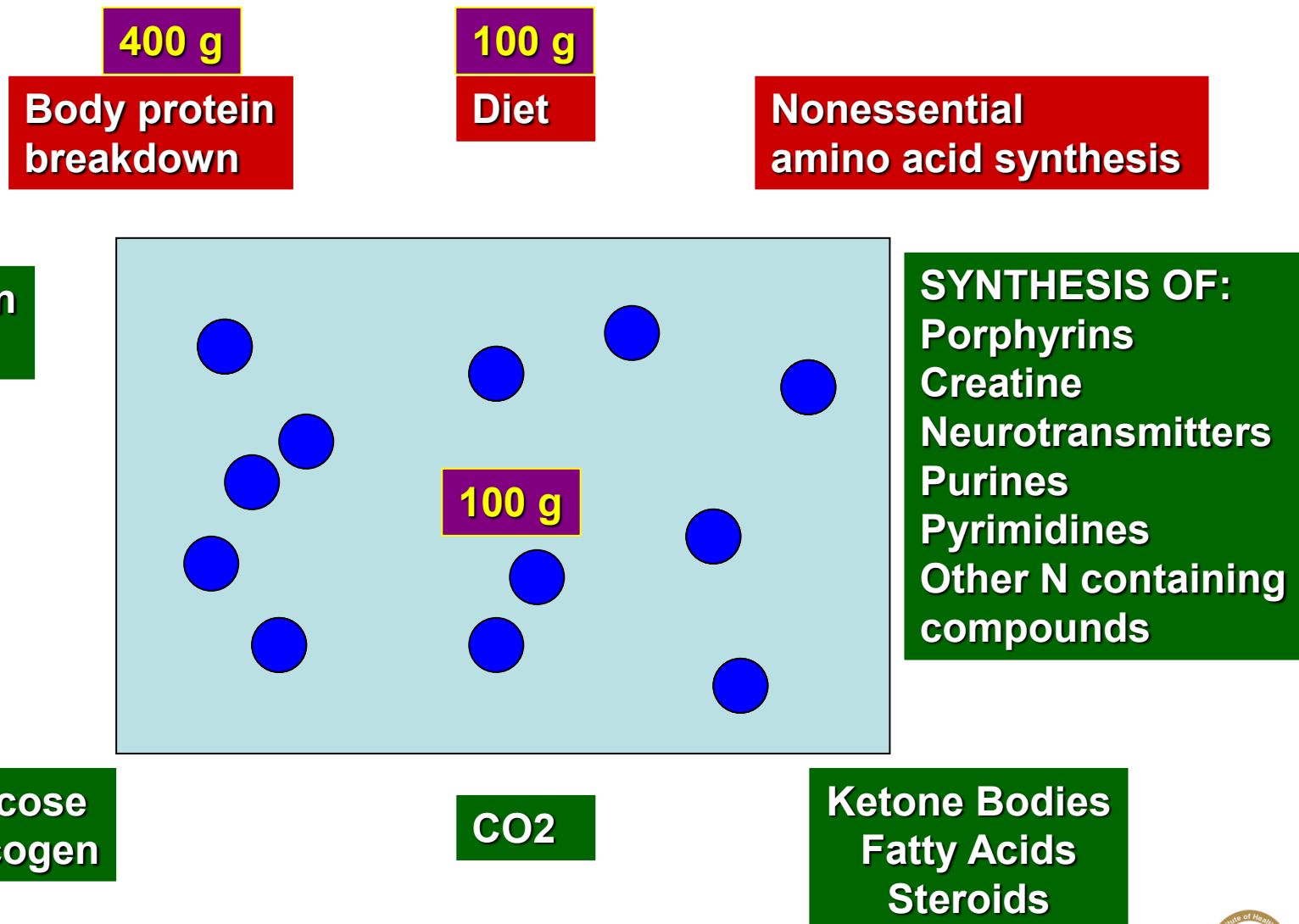
Neurotransmitters

Plasma proteins

Protein turnover

- 300-400g each day
- Short lived proteins
 - Regulatory proteins, misfolded proteins
- Long lived proteins
 - Structural proteins (collagen)

Amino acid pool



Nitrogen balance

- State of protein nutrition

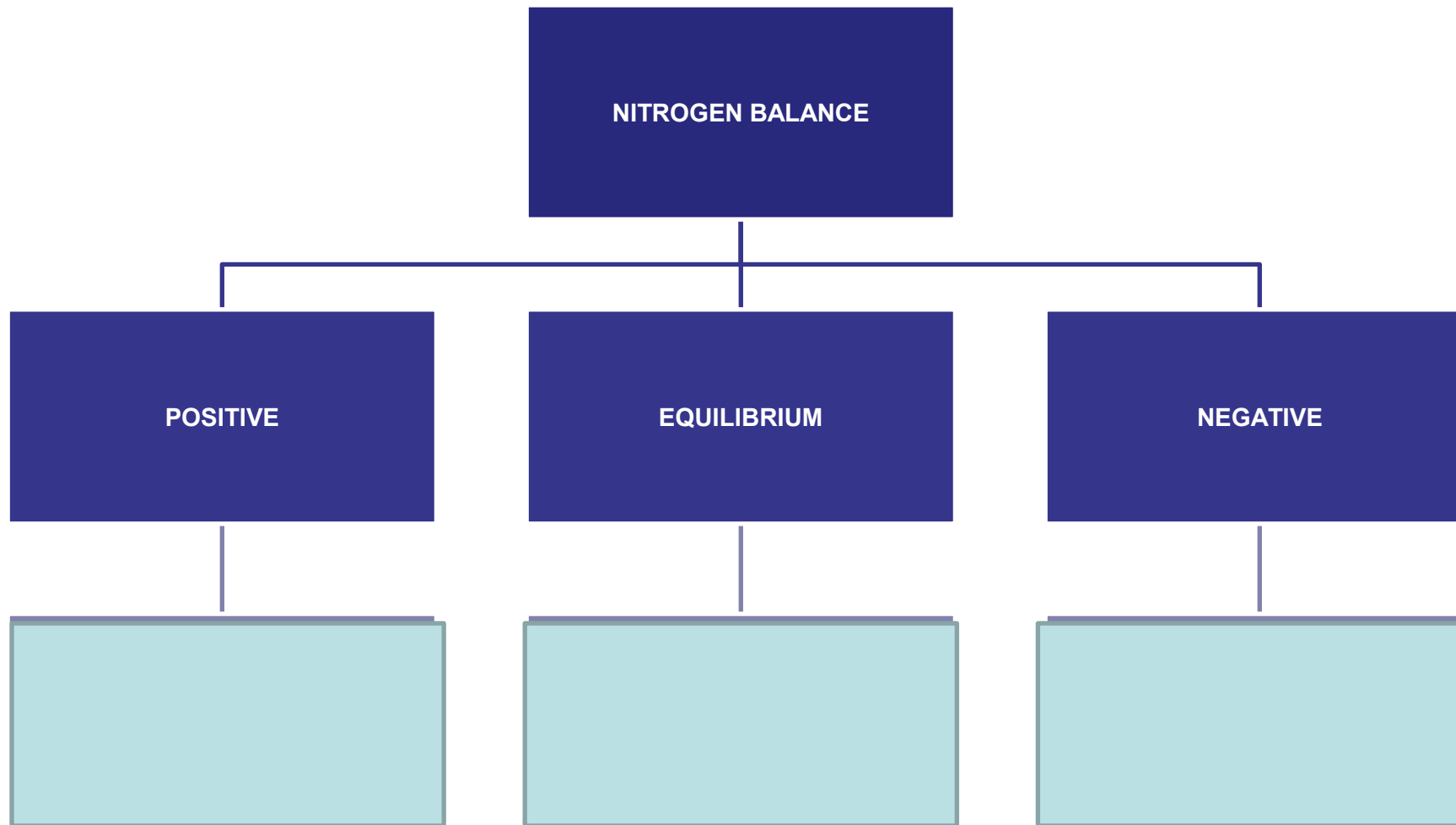
$$\text{mg of N} * 6.25 = \text{mg of protein}$$

- N is 16% of most proteins
- “The difference between intake and output of nitrogenous compounds is known as N balance”
- Output of N from the body
 - Urea, undigested (feces), sweat, shed skin

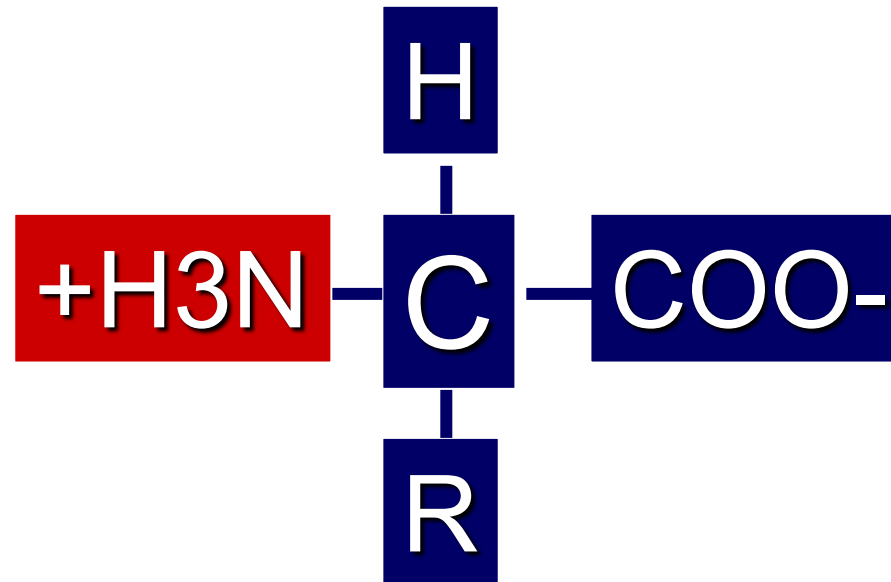
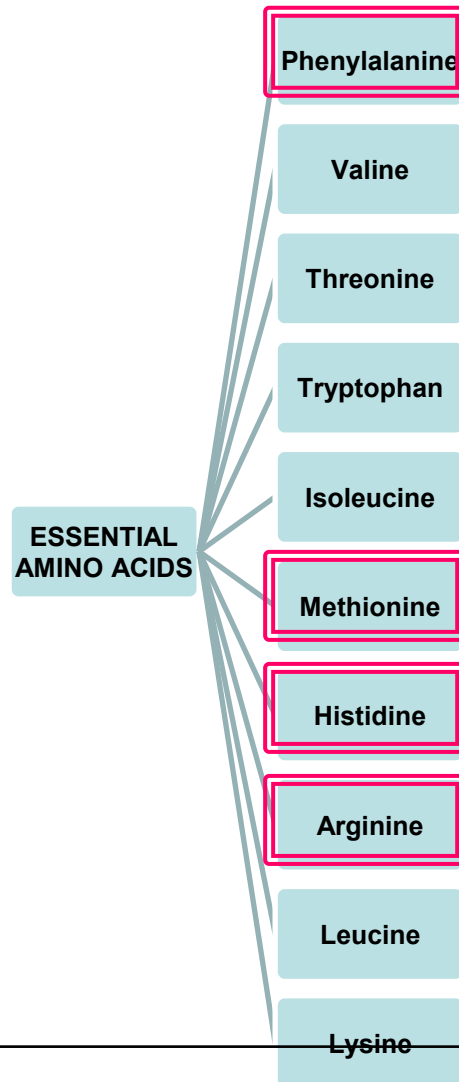
Obligatory nitrogen loss

- “Nitrogen lost from the body even when no protein is being consumed is termed obligatory nitrogen loss.”

3 states nitrogen balance



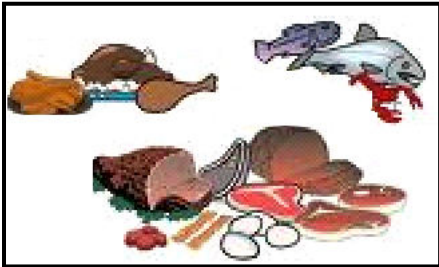
Essential amino acids



Protein quality

- “The quality of a protein is a measure of its ability to provide the essential amino acids required for tissue maintenance.”
- PDCAAS

PROTEIN QUALITY



SOURCE

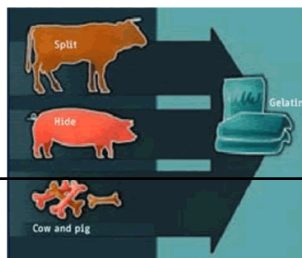


ANIMAL PROTEINS

PDCAAS = 0.8-1.00
Gelatin 0.08

PLANT PROTEINS

PDCAAS = 0.4-0.6
Soy protein 1.00



Protein quality

NPU = grams of protein digested and assimilated
grams of protein taken in diet

Protein quality

**P.E.R = grams of weight gain
grams of protein taken**

In a specified time period

Protein quality

- “The content of essential amino acids of a protein is matched with that of egg protein which is used as a reference standard, and has been assigned a chemical score of 100.”
- **PROTEIN QUALITY**
 - All essential amino acids
 - Optimal proportion
 - Easily digestible



PROTEIN QUALITY

CHEMICAL SCORE OF PROTEINS

**ANIMAL
PROTEINS**

**PLANT
PROTEINS**

**1ST CLASS
GRADE 1**

**2ND CLASS
GRADE 2**

Protein quality



WHEAT

(lysine deficient – methionine rich)



KIDNEY BEANS

(lysine rich – methionine deficient)

Protein quality



WHEAT + KIDNEY BEANS
(lysine rich– methionine rich)

Requirement of protein



2g/kg/day

**Pregnancy
Lactation**

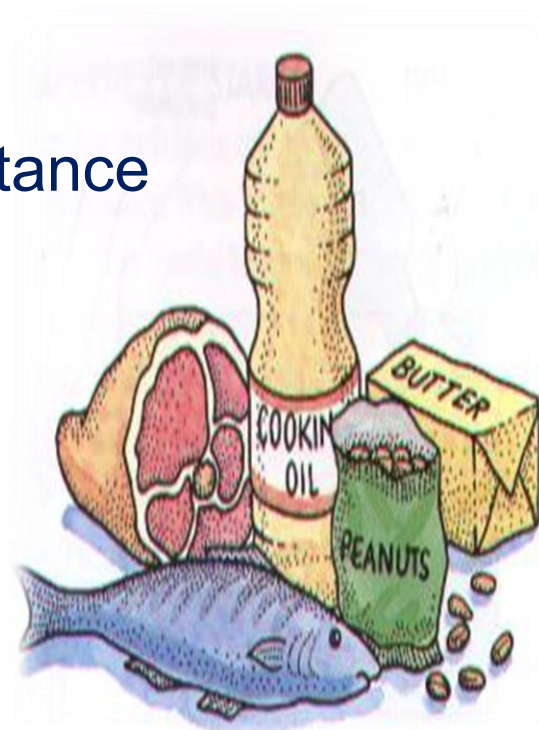
Additional 30g/day

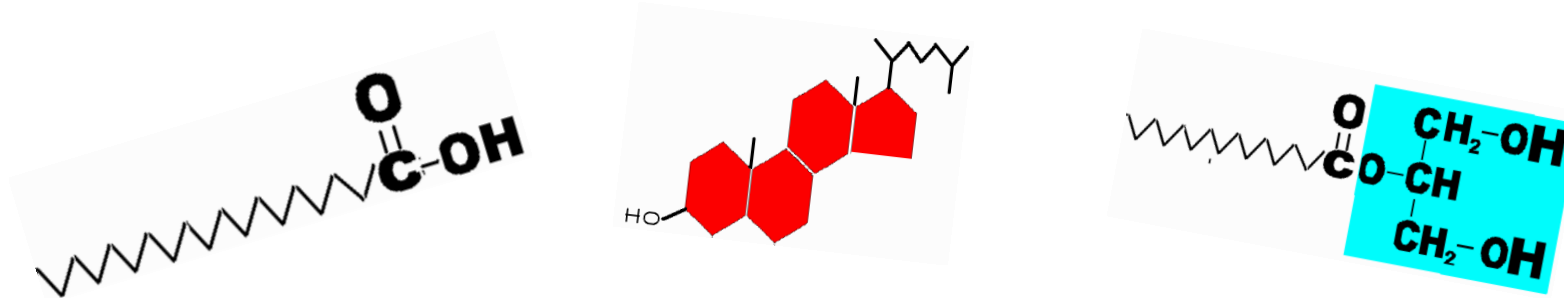


1g/kg/day

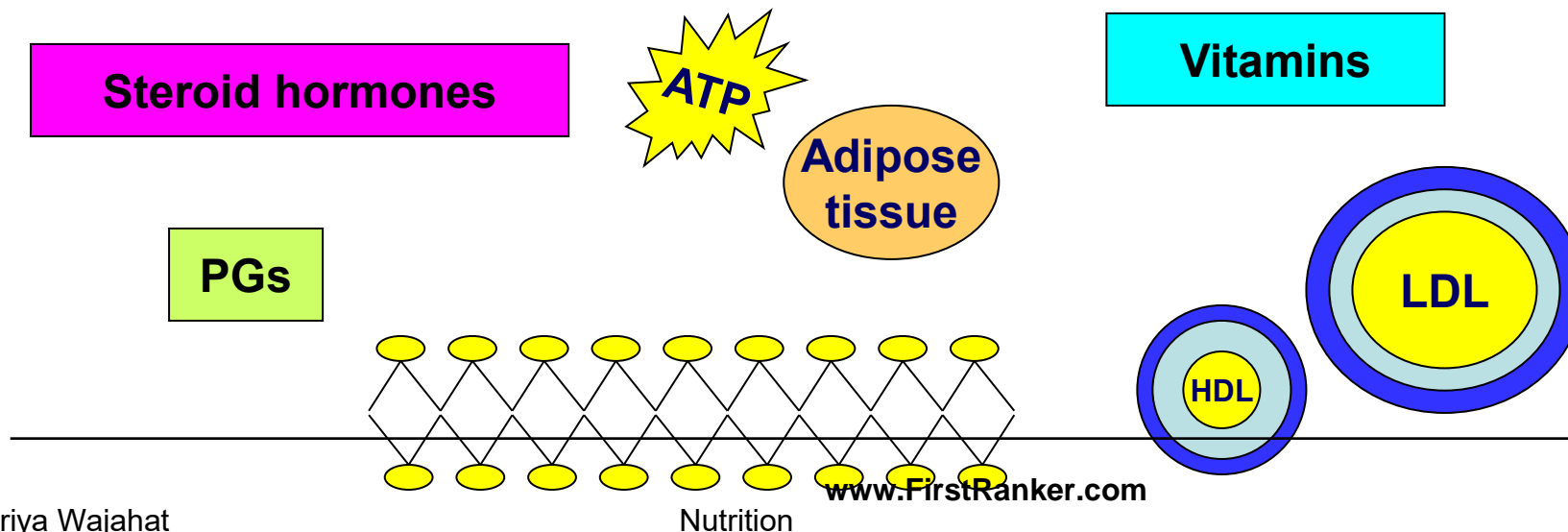
- Importance of lipids in diet
- Dietary fats and plasma lipids
- Essential fatty acids
- Plasma cholesterol level and its importance
- Trans fatty acids
- What is peroxidation of PUFA?

LIPIDS





Importance of lipids in diet



Triacylglycerols

- Constituent fatty acids
- Double bonds
 - Presence/ absence
 - Number/ location
 - Cis/ trans
- Saturated fats, LDL & Cardiovascular disease
- Sources of saturated fats



Triacylglycerols

- Monounsaturated fats
 - ↓ Total and LDL cholesterol
 - ↑ maintain or ↑ HDL cholesterol
 - Vegetables and fish
- Polyunsaturated fats
 - Location of double bonds
 - N-6 or Ω 6 fatty acids
 - N-3 or Ω 3 fatty acids



Click to revise fatty acid structure

n-6 or Ω 6 Fatty acids

- Vegetable oils
 - Nuts, avocados, olives, soybeans, cottonseed, sesame and corn oil
- Lower plasma LDLs
- Lower plasma HDLs

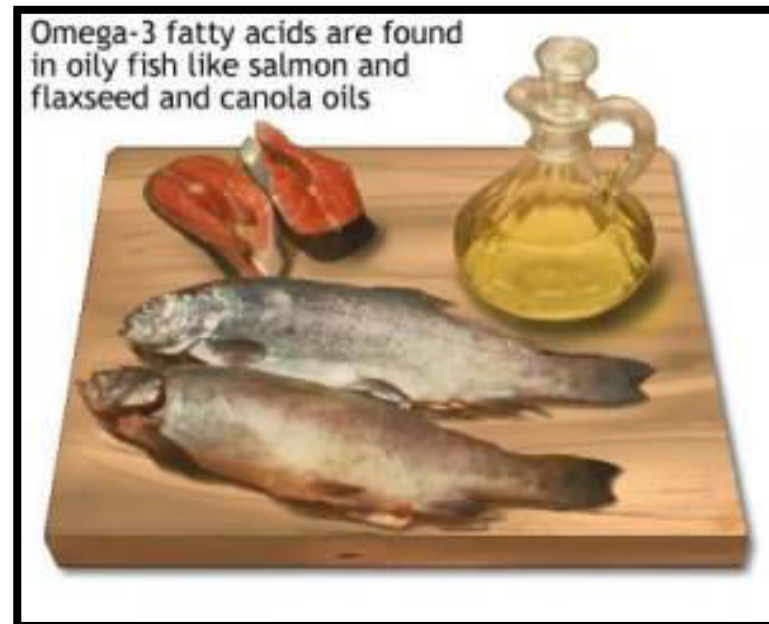


Also a tree springing out of Mount Sinai, which produces oil, and relish for those who use it for food.

20- Al Mûminûn (Al-Quran)

n-3 or Ω 3 Fatty acids

- Plants and fish oils
 - DHA and EPA
- Reduce risk of cardiovascular mortality
 - Little effect on HDL and LDL
 - Suppress cardiac arrhythmias
 - Reduce serum TAG
 - Decrease tendency to thrombosis



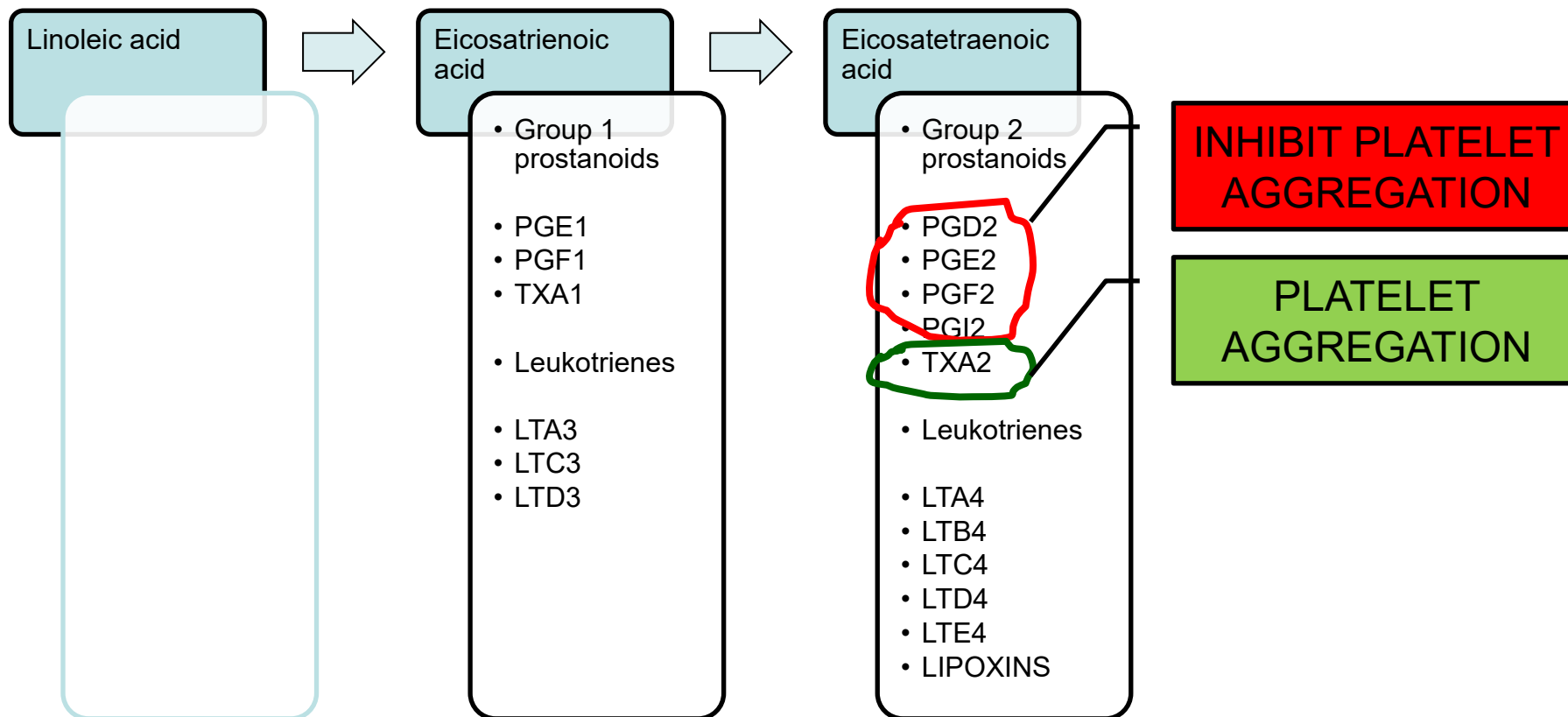
It is He Who has made
the sea subject, that ye
may eat thereof flesh
that is fresh and
tender.....

14- An Nahl (Al Quran)

IMPORTANCE OF Ω 3 FAs

Ω 6 family of fatty acids and their products LINOLEIC ACID		
Linoleic acid	Eicosatrienoic acid	Eicosatetraenoic acid

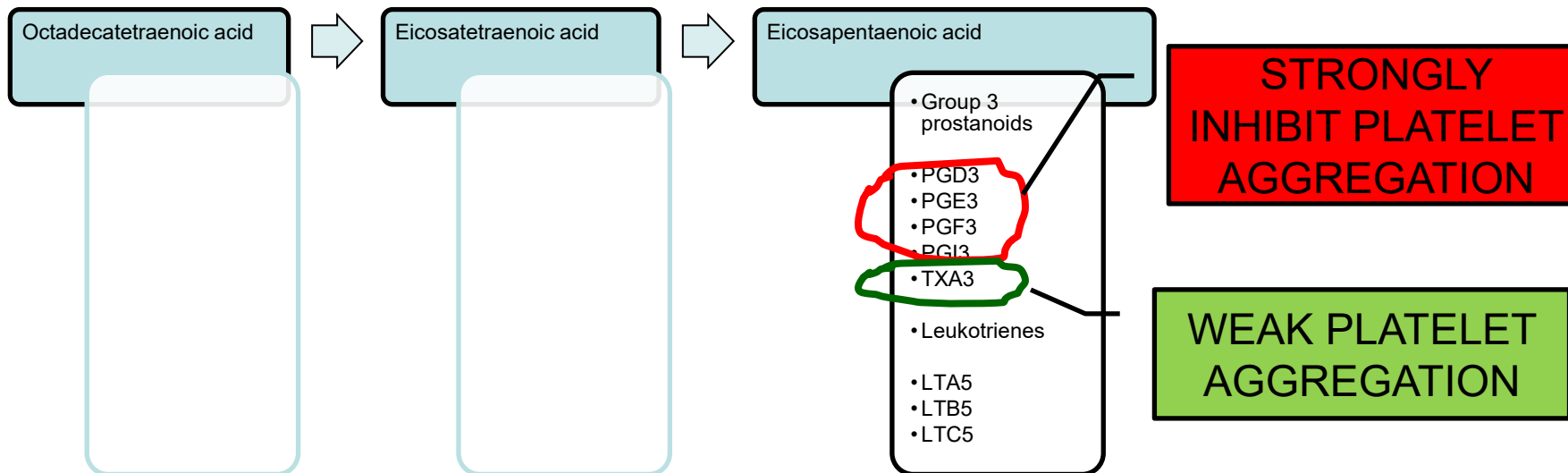
IMPORTANCE OF Ω 3 FAs



IMPORTANCE OF Ω 3 FAs

Ω 3 family of fatty acids and their products LINOLENIC ACID		
Octadecatetraenoic acid	Eicosatetraenoic acid	Eicosapentaenoic acid

IMPORTANCE OF Ω 3 FAs



Plasma cholesterol level and its importance

- Source
 - Endogenous biosynthesis
 - Diet (animal products)
- Transport
 - Lipoproteins
 - LDL and CHD
 - Smoking, obesity, sedentary lifestyle, ↑ TAG
 - HDL
- Effect of dietary cholesterol on plasma cholesterol
 - Amount and types of FA (diet induced changes 10-20%)
 - Carbohydrate (decrease HDL, increase TAG)
 - Soy protein, B6, B12 and folate (decrease plasma cholesterol)
- Effect of Statin drugs on plasma cholesterol
 - Decrease plasma cholesterol by 30-40%

Trans fatty acids

- Classified as unsaturated but behave as saturated
- Elevate LDLs
- Source
 - Not in plants
 - Small amounts in animals
 - Manufacture of margarine

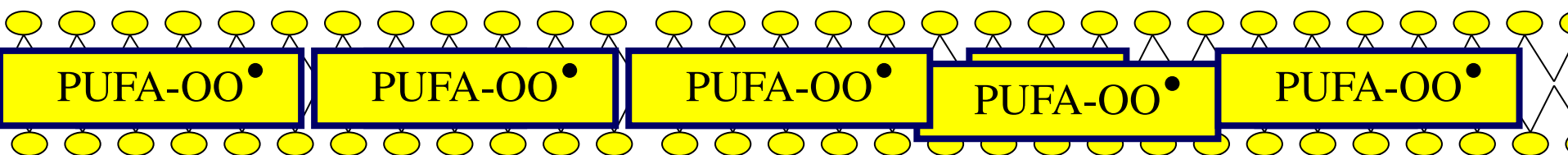




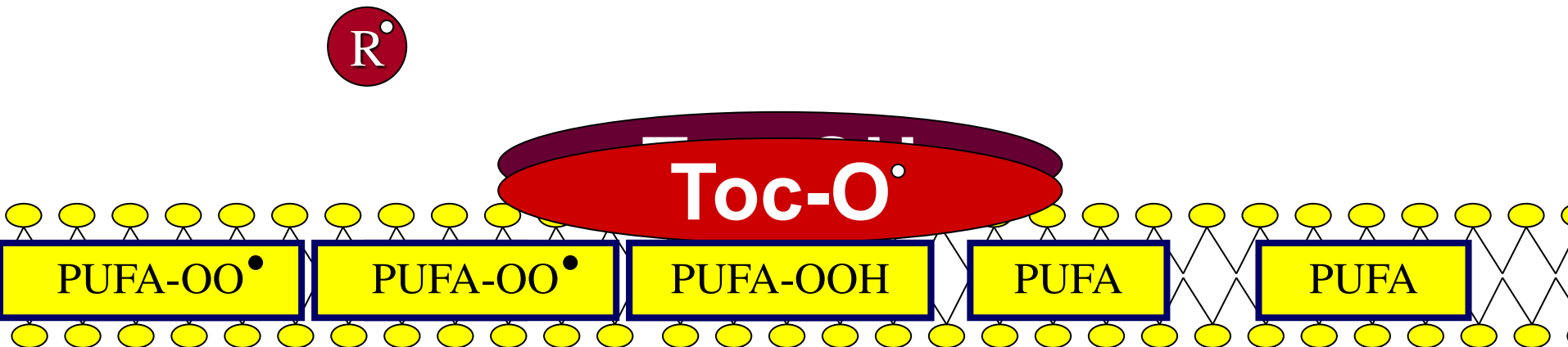
Free radicals

- Aerobic metabolism
 - Superoxide
 - Hydrogen peroxide
 - Hydroxyl
- Other toxins
 - Environmental
 - Metabolism of drugs
- Damage
 - Proteins
 - DNA
 - Lipid peroxidation

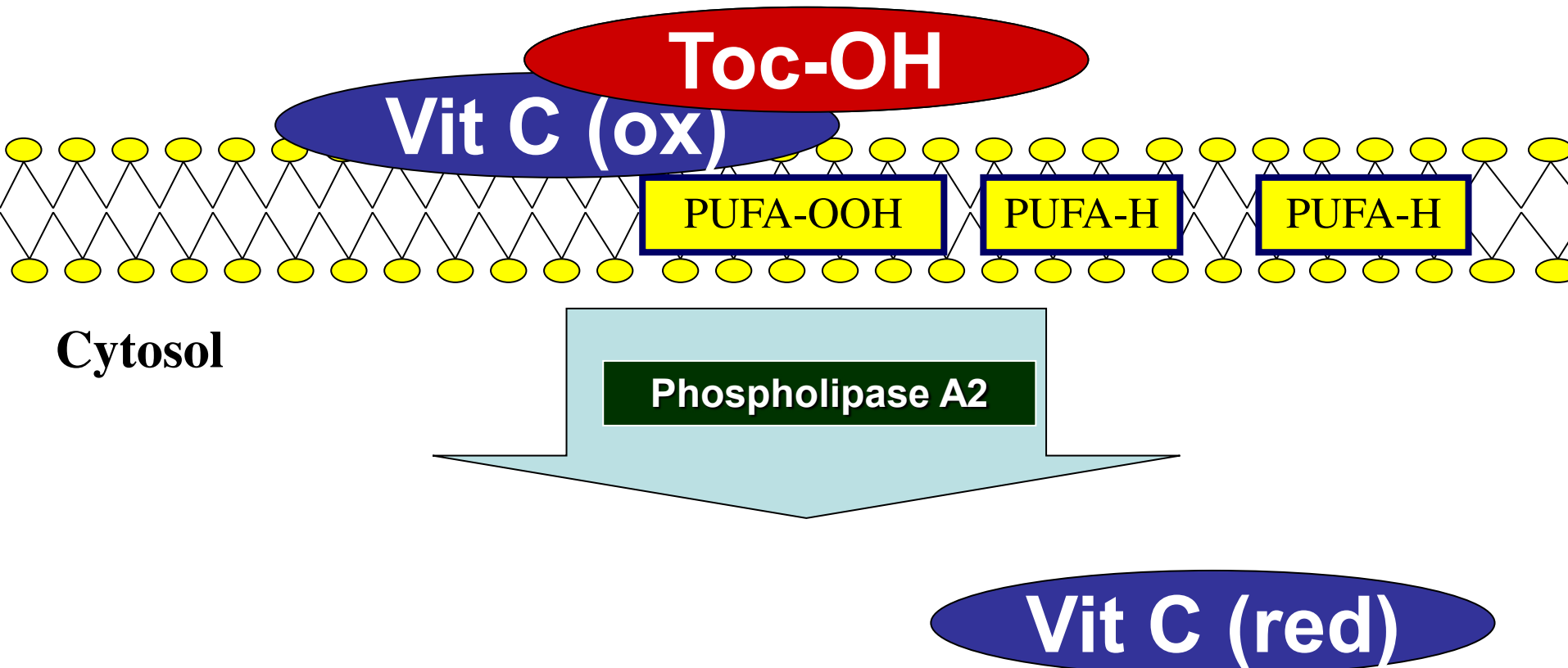
PUFA and lipid peroxidation



Vitamin E and C as antioxidants



Vit C as an antioxidant



Cytosol

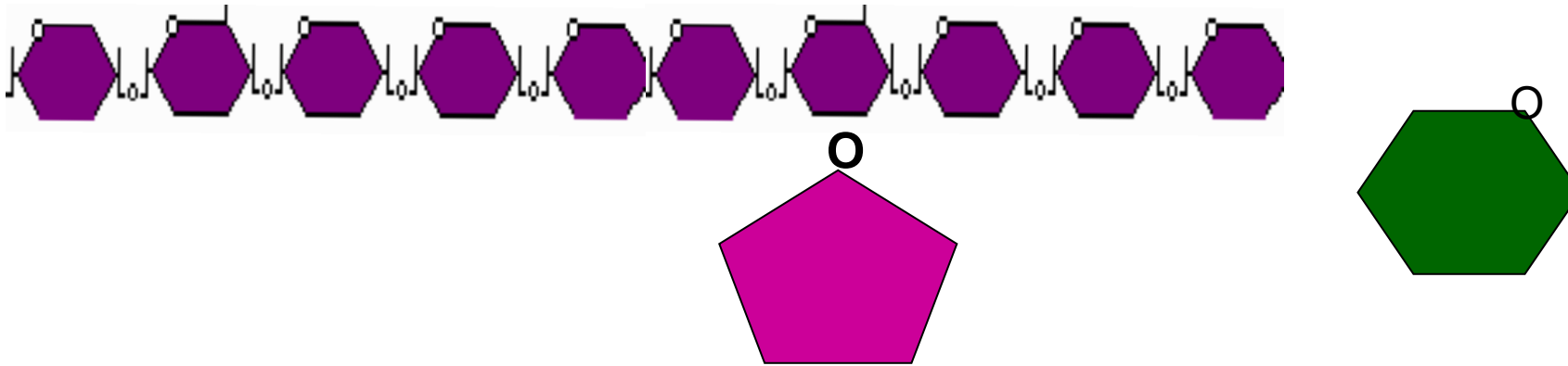
PUFA and Lipid Peroxidation

- Chain reaction providing continuous supply of free radicals that initiate further peroxidation.
- Effects
 - Rancidity
 - Tissue damage
 - Inflammatory disease, cancer, atherosclerosis and aging
- Antioxidants
 - Food additives
 - Propyl gallate, butylated hydroxyanisole BHA etc
 - Naturally occurring
 - Water soluble and Lipid soluble
 - Vit C and urate
 - Vit E
 - Chain breaking and preventive
 - SOD, urate and Vit E
 - Catalase and Glutathione peroxidase

- Importance of carbohydrates in diet
- Requirements for carbohydrate
- Glycemic index of food
- Importance of dietary fiber
- Sachaarin

CARBOHYDRATES

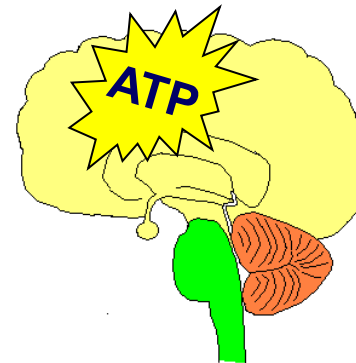




Importance of carbohydrates in diet

Protein sparing

Glycosylation of proteins



Liver and muscle glycogen

Requirements for carbohydrates

- Not essential
- Absence leads to:
 - Ketone body production
 - Degradation of body protein
- RDA
 - 130g/day
 - 45-65% of total calories

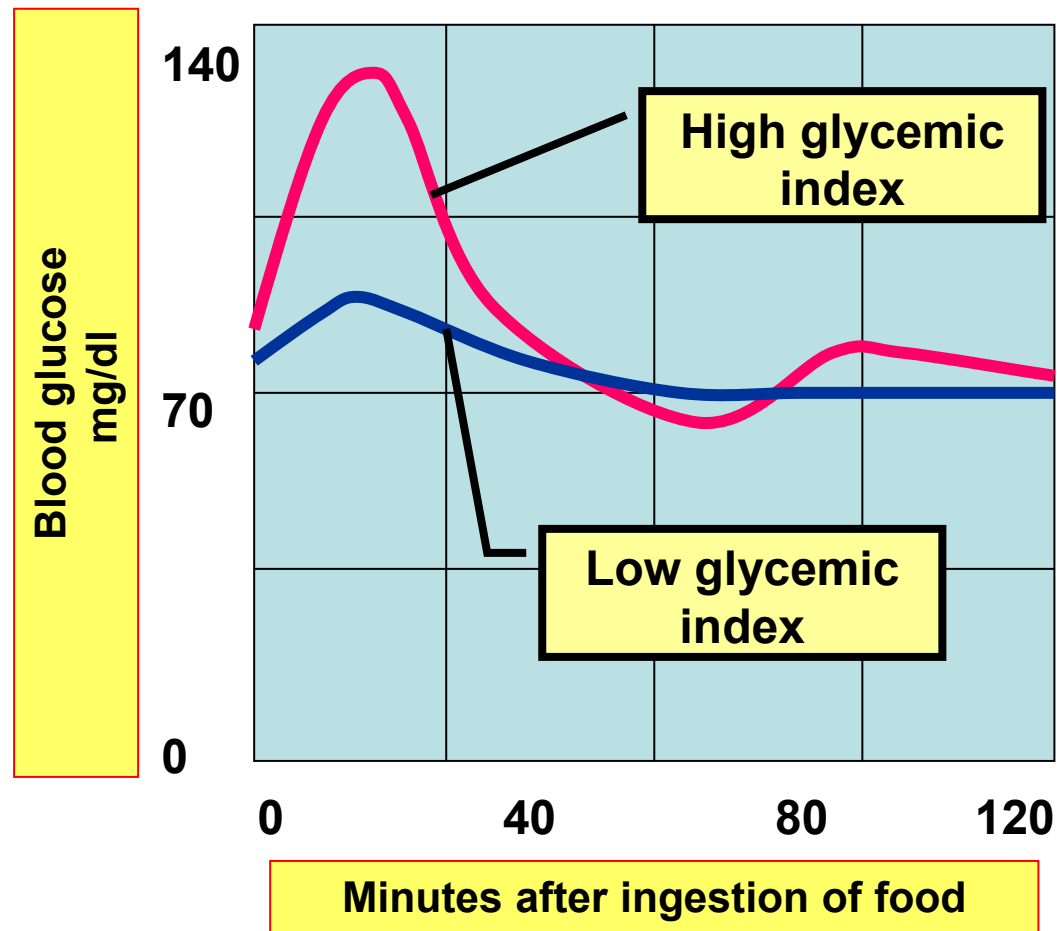
Glycemic index of food

Glycemic index is the area under the blood glucose curves seen after ingestion of a meal with carbohydrate rich food,

compared with

the area under the blood glucose curve observed after a meal consisting of the same amount of carbohydrate in the form of glucose or white bread.

Glycemic index of food



Dietary fiber

Non starch polysaccharide NSP

- Non digestible carbohydrates

Lignin

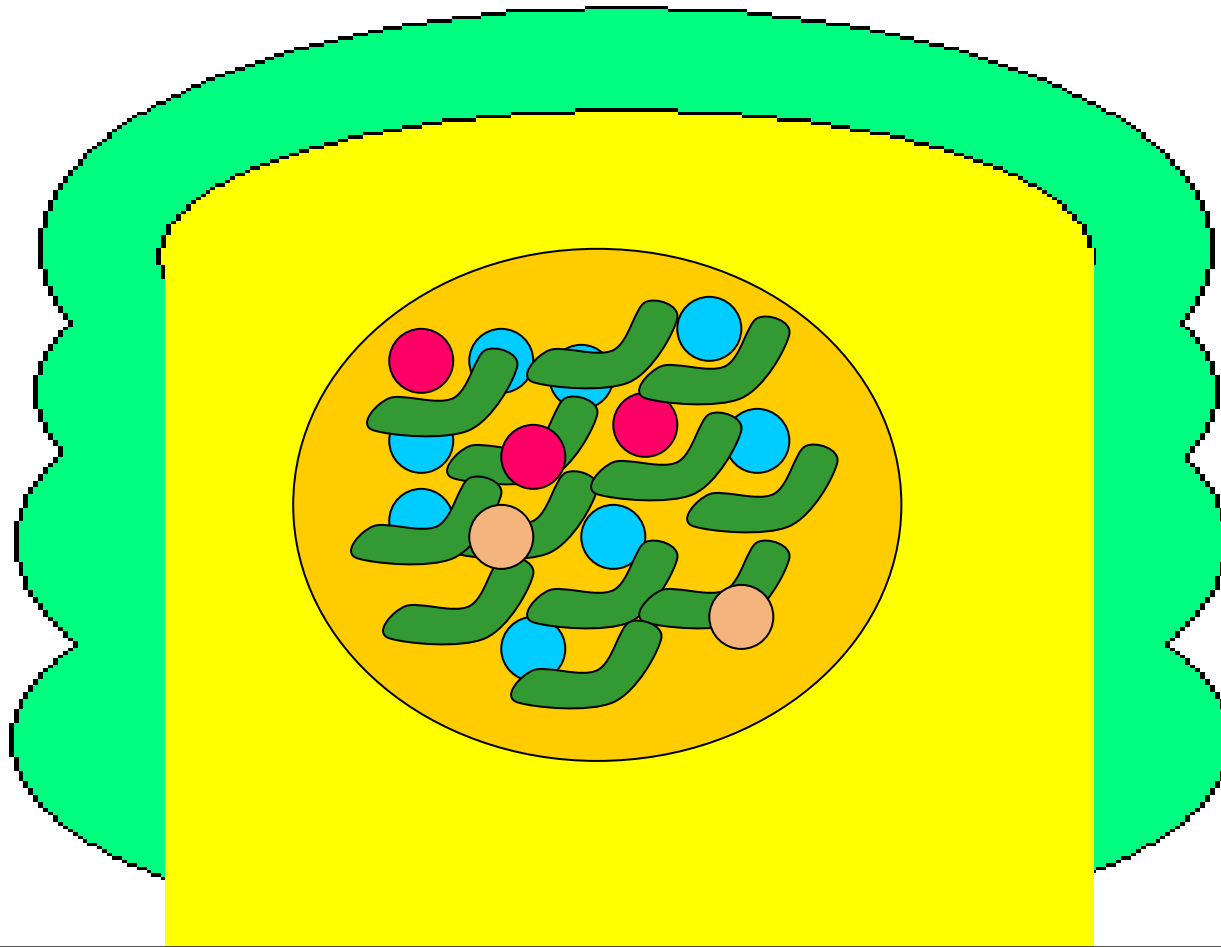
- Polymer of phenylpropanoid subunits
- Total fiber
 - Dietary fiber
 - Functional fiber
- Soluble fiber
- Insoluble fiber



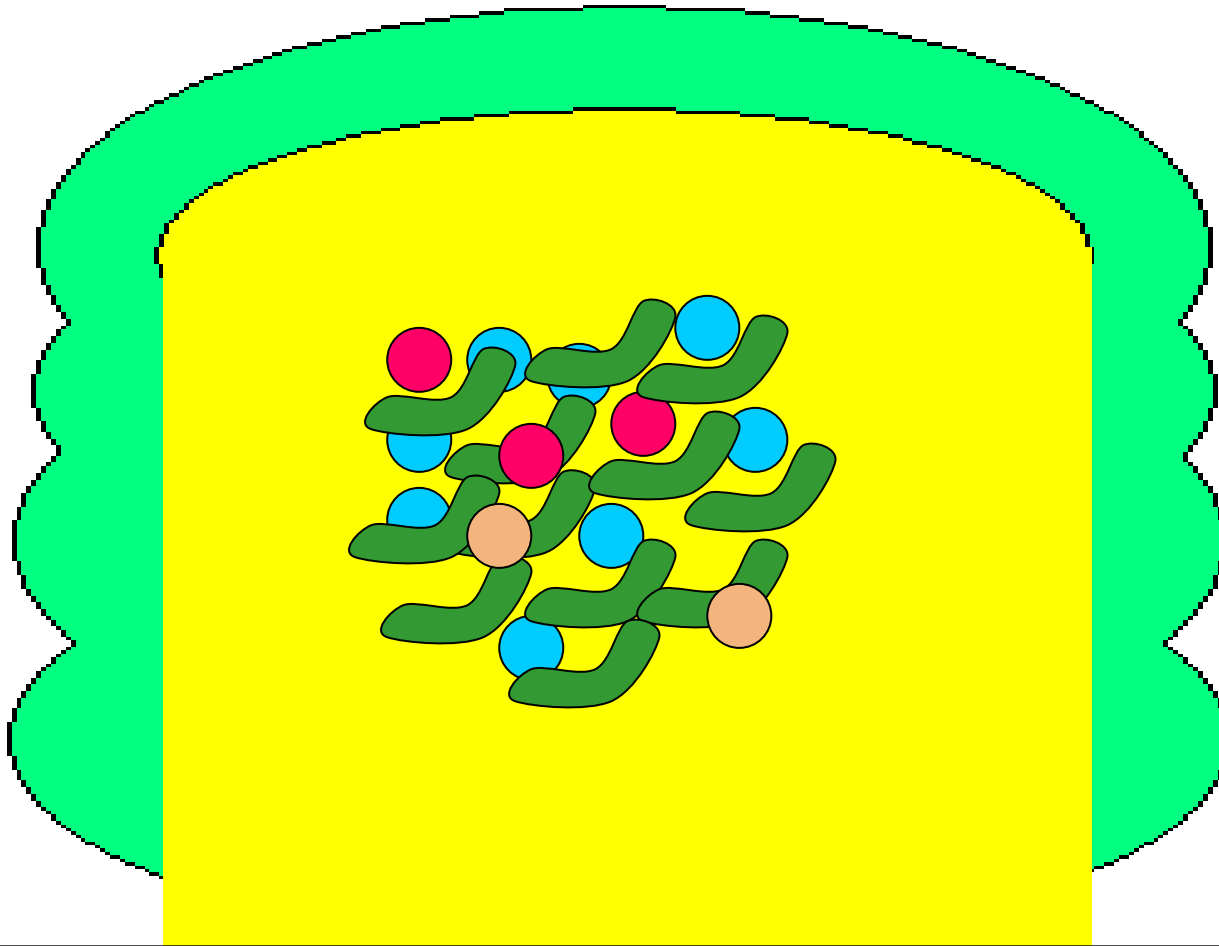
Fiber ----Health benefits

- Delays gastric emptying
- Reduces postprandial blood glucose concentration
- Reduces constipation, hemorrhoid formation
- Increases bowel motility
- Decreases absorption and increases fecal loss of cholesterol

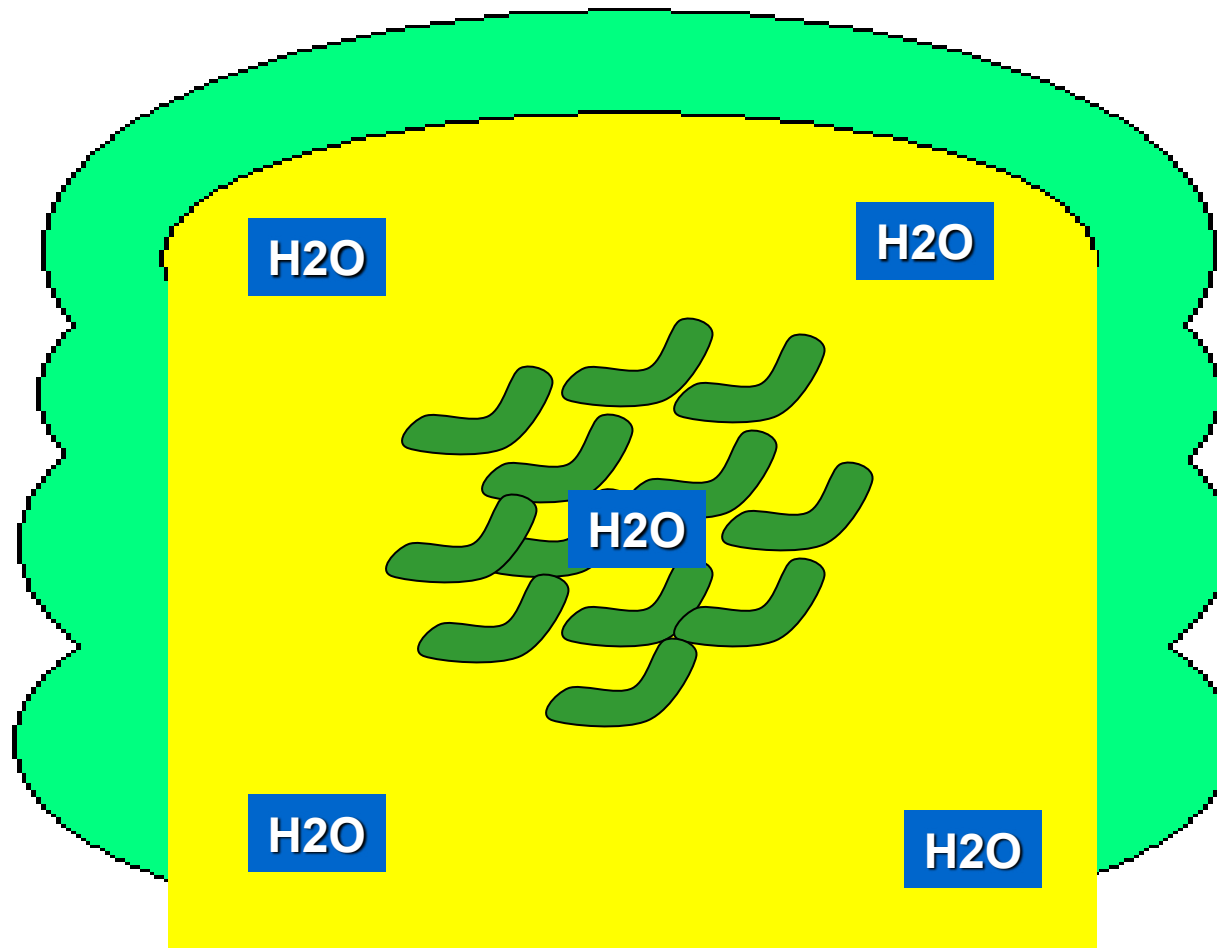
Fiber ----health benefits



Fiber ----Health benefits



Fiber ----Health benefits



Growing incidence of metabolic syndrome

DIET, LIFESTYLE AND DISEASE

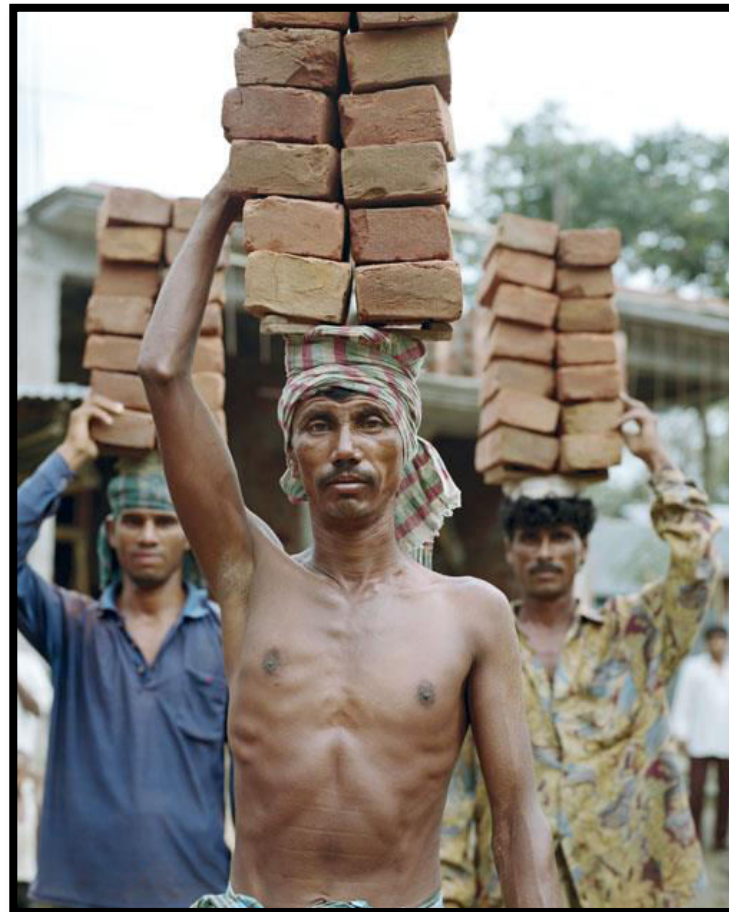
Mankind was closer to nature...



They had to work hard...



Life was not easy...



Work involved physical activity



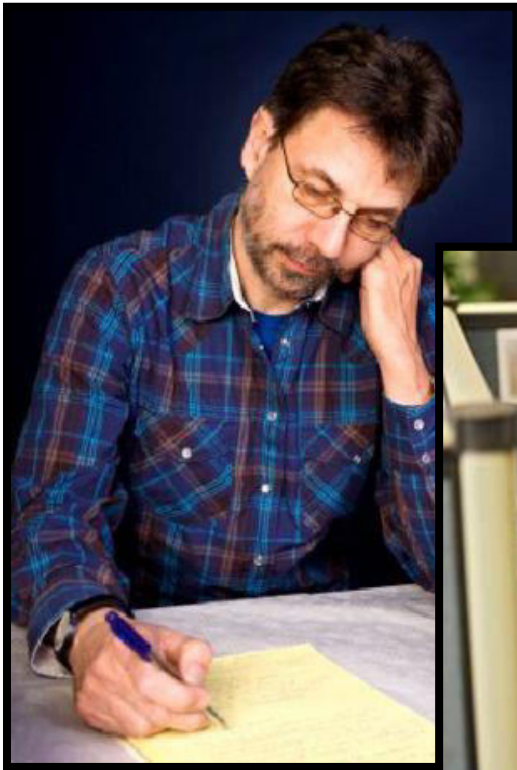
Diet was pure....



...and balanced



Changing life styles...



Outdoor fun!



Enjoyment limited to indoor activities



Amusement for the kids...



Dining out...



Growing incidence of childhood obesity



Lip-smacking indeed!



Adulteration and fortification?



What's the ideal?



A premium beverage?



Food additives

- The GRAS list
- Antioxidants
- Sequestrants
- Food flavors
- Flavor enhancers
- Food colors
- Anticaking agents
- Stabilizers and Thickeners

Stabilizers, thickeners and gelling agents, like agar or pectin (used in jam for example) give foods a firmer texture.

Non-nutritive sweeteners

- Saccharin
- Aspartame
- Acesulfame K
- Sucralose
- Stevia



Article:

Bitter Battle over Truth in Sweeteners

Christopher Wanjek

Date: 15 May 2007 Time: 05:45 AM ET

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Go Ahead, Drink Bacon Grease for Breakfast

McNeil Nutritionals, the makers of Splenda, the most popular-selling artificial sweetener in the United States, is feeling bitter these days.

Monsanto, the makers of Equal, sued Splenda in France and in the United States over Splenda's slogan, "made from sugar so it tastes like sugar," which Equal and an unlikely ally, the Sugar Association, say is misleading.

Last week a French court sided with Equal, ordering Splenda to punt the slogan in France. Then on Friday, just moments before a U.S. jury was about to read its verdict, Splenda, sensing defeat, reached an undisclosed settlement with Equal.

The last-second settlement was highly unusual, forcing the judge to instruct the jury never to speak of its verdict. And both companies are mum on the settlement, which insiders say will cost Splenda millions of dollars. It is unclear who the winner is, though, as all sides

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HEALTHY EATING & DIET

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Fitness

- Fact vs. Fiction
- Tips for Success
- Get Lean
- Get Strong
- Fuel Your Body
- Expert Advice



Drink More Diet Soda, Gain More Weight?

Overweight Risk Soars 41% With Each Daily Can of Diet Soft Drink

By [Daniel J. DeNoon](#) Reviewed by [Charlotte E. Grayson Mathis, MD](#)
 WebMD Health News

June 13, 2005 -- People who drink [diet](#) soft drinks don't [lose weight](#). In fact, they [gain weight](#), a new study shows.

The findings come from eight years of data collected by Sharon P. Fowler, MPH, and colleagues at the University of Texas Health Science Center, San Antonio. Fowler reported the data at the annual meeting of the American Diabetes Association in San Diego.

"What didn't surprise us was that total soft drink use was linked to [overweight](#) and [obesity](#)," Fowler tells WebMD. "What was surprising was when we looked at people only drinking diet soft drinks, their risk of obesity was even higher."

In fact, when the researchers took a closer look at their data, they found that nearly all the obesity risk from soft drinks came from diet sodas.

There was a 41% increase in risk of being overweight for every can or bottle of diet

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Healthy Living Tools




WebMD Food & Fitness Planner

Diet and exercise just got a lot easier. Introducing the new way to meet your healthy living goals.



Diet Evaluator

Get a personal assessment of your diet



BMI Plus Calculator

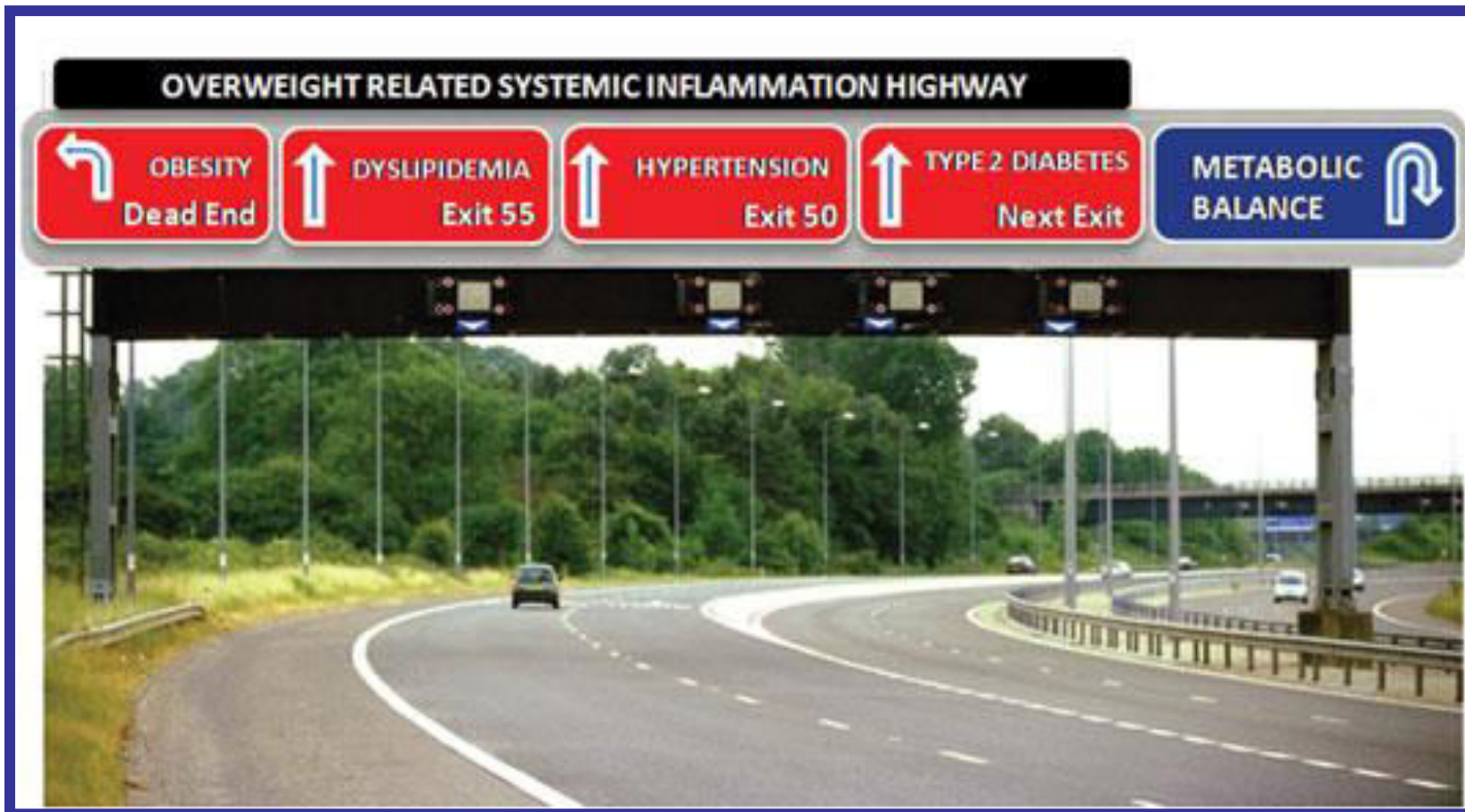
Get BMI info and calculated fitness goals

Today in Healthy Eating & Diet

Fast and yummy!



Heading towards...demise!



The outcome!

Metabolic syndrome



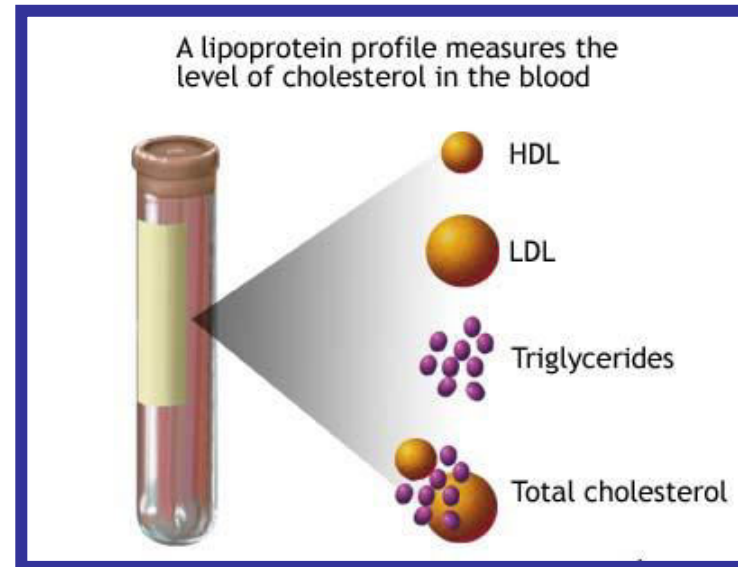
A condition that you eat your way into

- Getting older
- Carrying extra pounds
- Being sedentary
- Diet
 - Low in fiber
 - High in calories
 - Full of saturated fat
- Smoker

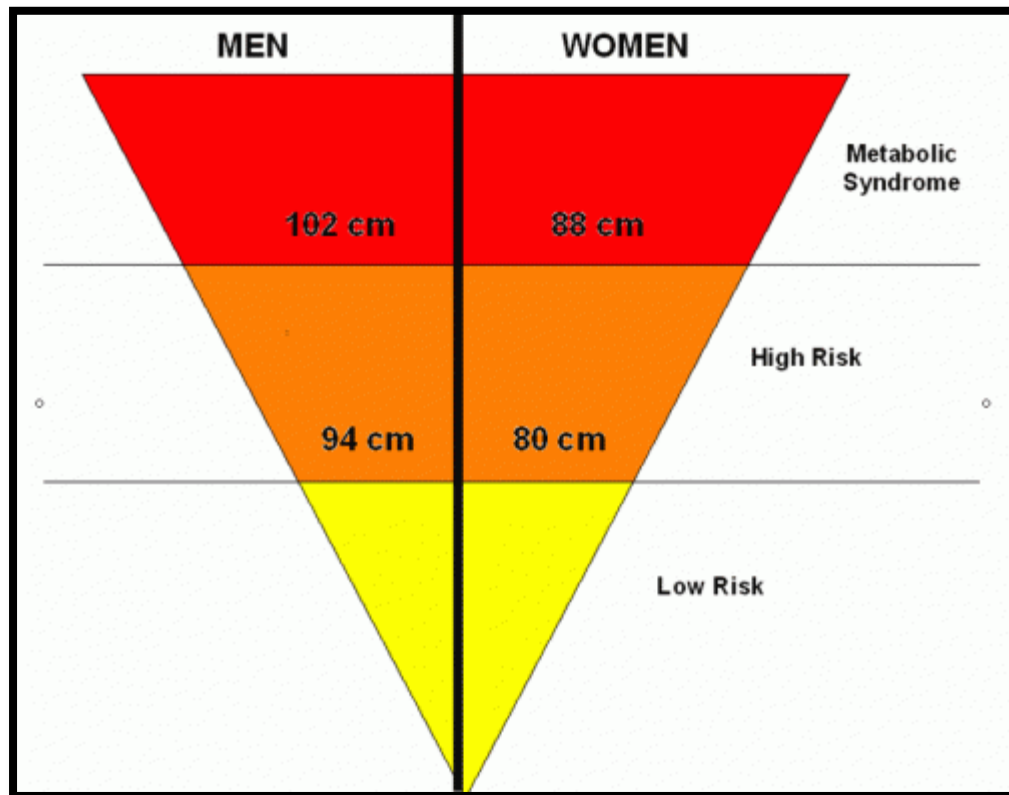


Metabolic syndrome— diagnosis

- Belly fat
- High TAG levels
- Low HDL cholesterol
(or low HDL/LDL ratio)
- High blood pressure
- High fasting glucose levels/Insulin
resistance or glucose intolerance



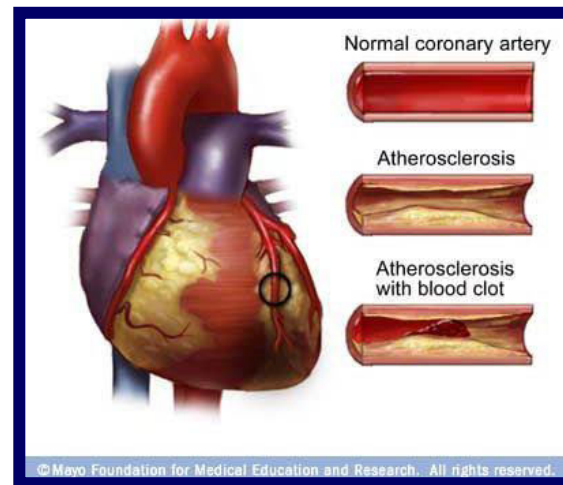
Risky waist measurements



Risks associated with metabolic syndrome

Plaque build-ups in artery walls

- Coronary heart disease
- Stroke
- Peripheral vascular disease
- Type II diabetes



It takes less time and energy to get fast food and it is a lot cheaper.

But don't wait until it is too late

Take action today.

Stay healthy, Eat right.

Regulation of food intake

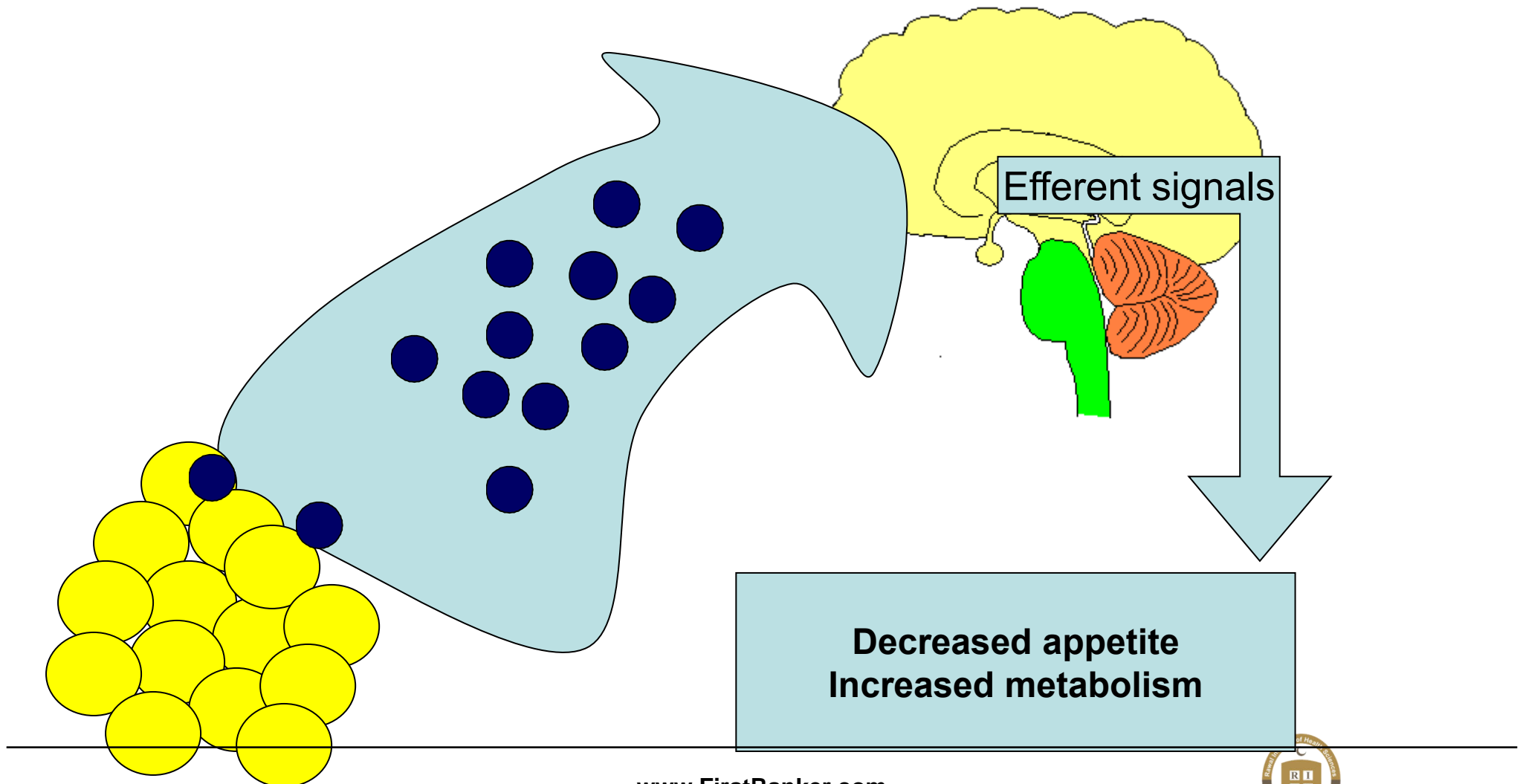


- Hunger center
 - Lateral hypothalamic area
- Satiety center
 - Ventromedial nucleus

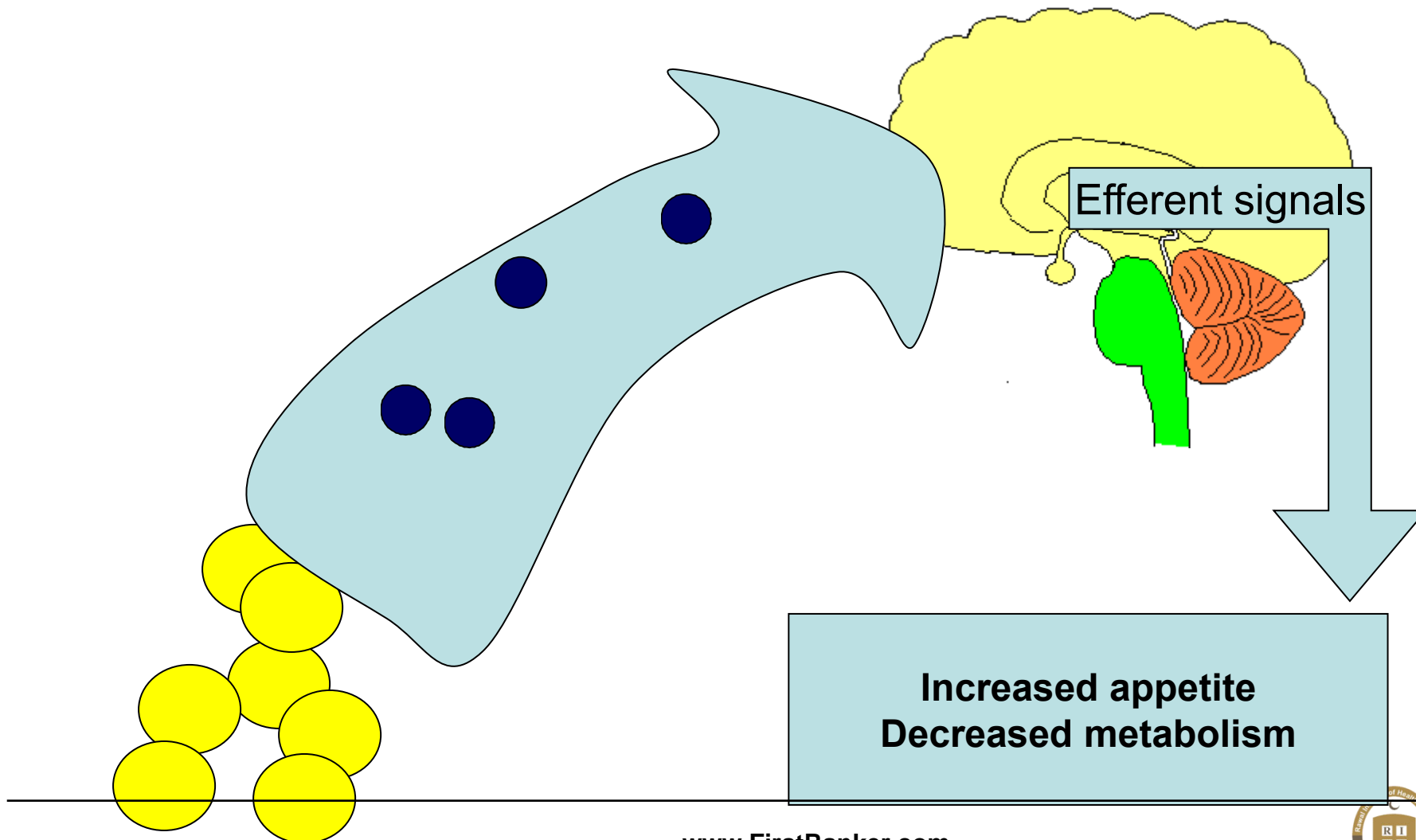
Regulation of food intake

- Hormones that decrease appetite
 - Leptin
 - Adiponectin
 - Resistin
- Hormones that increase appetite
 - Ghrelin

Regulation of food intake



Regulation of food intake



Anthropometric studies

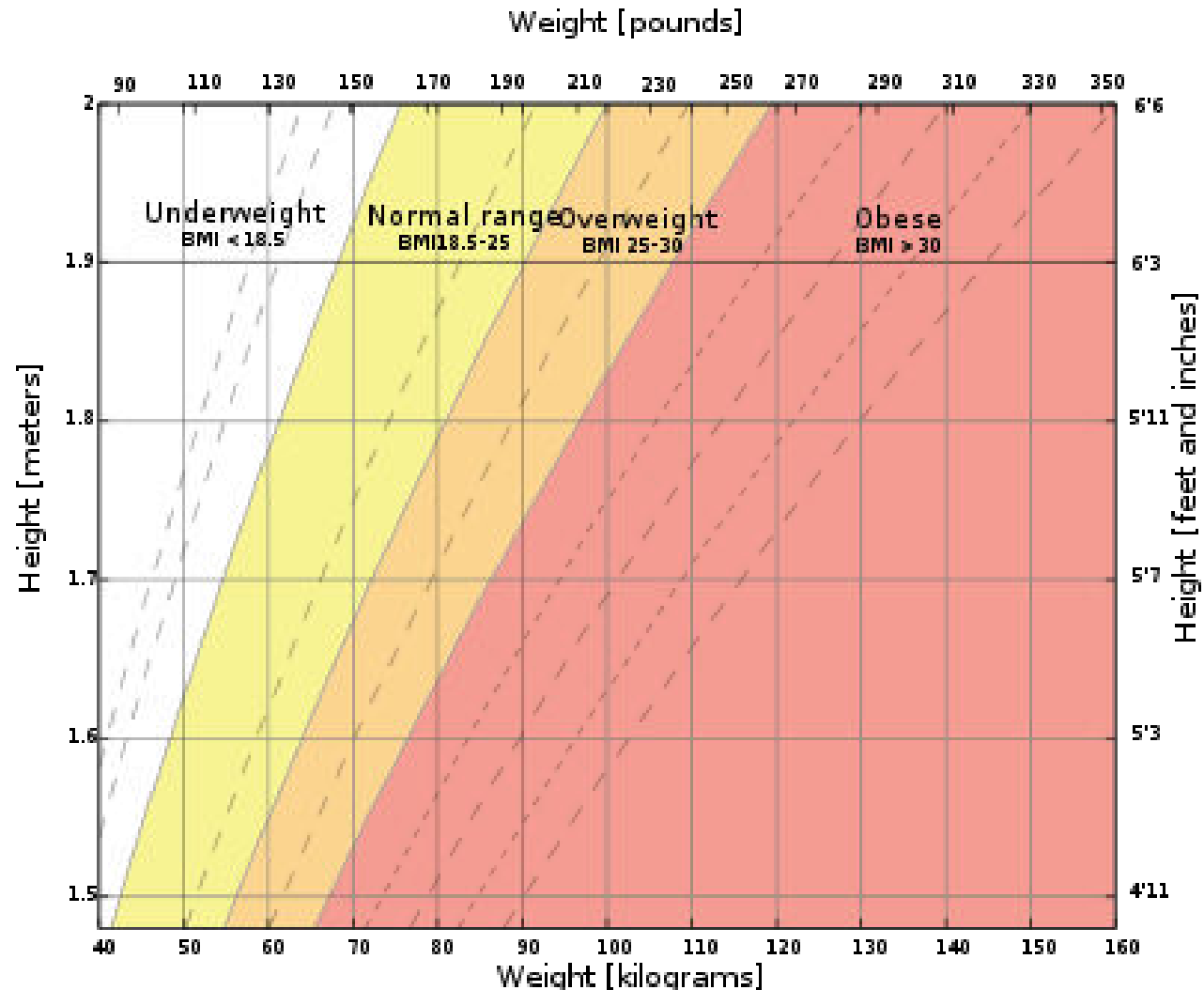
- Height and weight
- Waist hip ratio
- BMI
- Skinfold measurements
- Densitometry
- Ultrasound
- Bioelectrical impedance
- Computed tomography
- Serum albumin level

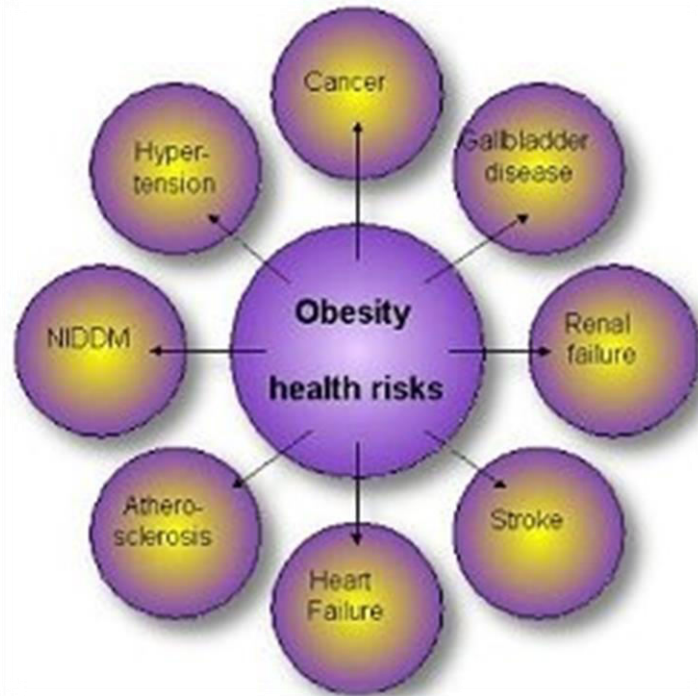
Body mass index

- “Body mass index (BMI) or Quetelet Index is a statistical measure of the weight of a person scaled according to height.”

$$\text{Body Mass Index (BMI)} = \text{Weight (kg)} / \text{Height (m)}^2$$

BODY MASS INDEX





A silent killer

OBESITY



Man is a creature of haste! Soon will I show you My signs; so ask Me not to hasten.

37- Al Anbiyāa Al Quran

It takes less time and energy to get fast food and it is a lot cheaper.

But don't wait until it is too late

Take action today.

Stay healthy, Eat right.

Obesity

TYPES OF FAT

```
graph TD; A[TYPES OF FAT] --> B[WHITE]; A --> C[BROWN]
```

WHITE

BROWN

Obesity

TYPES OF FAT

Subcutaneous

Thighs

Scapula

Costal

Triceps

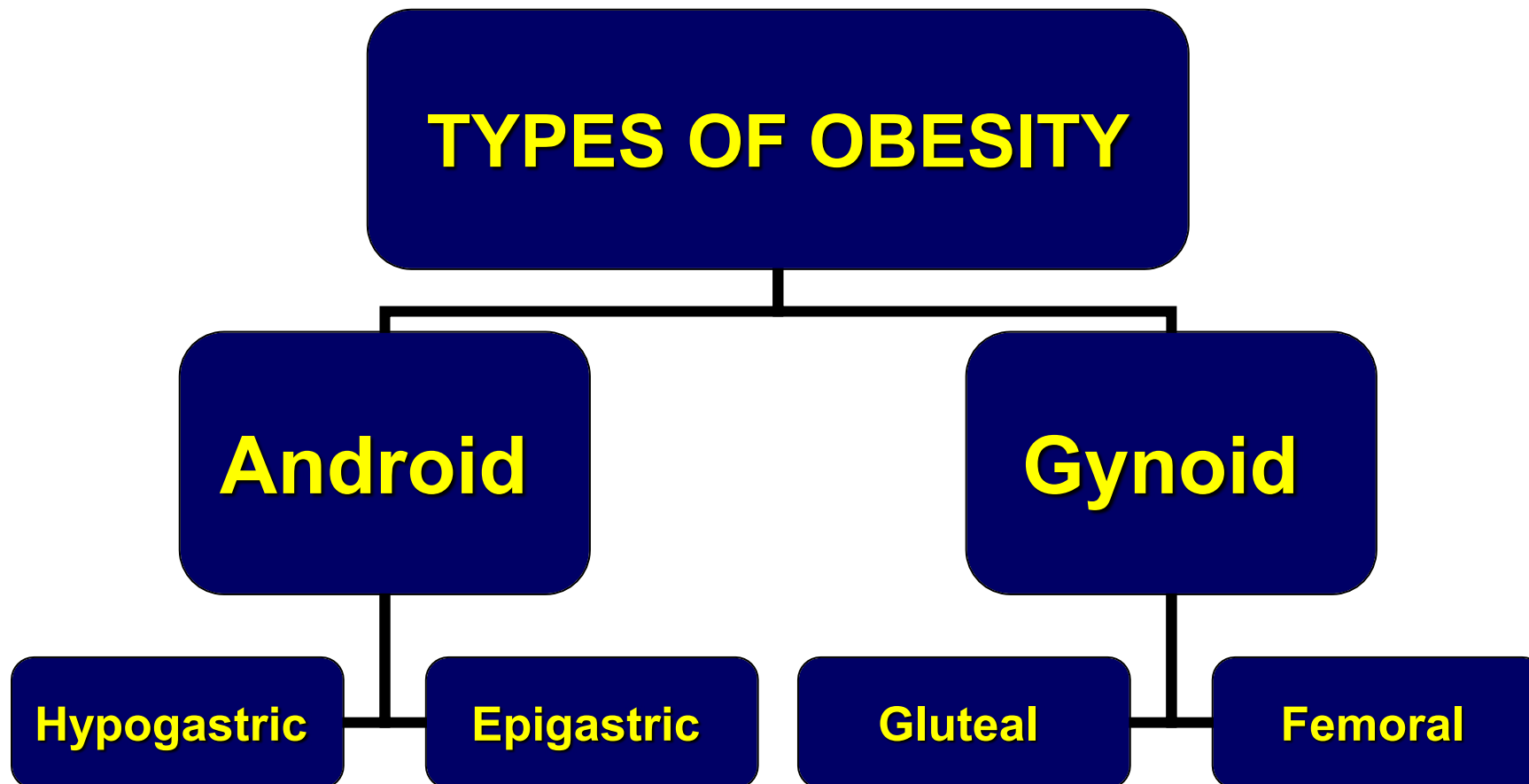
Visceral

Retroperitoneal

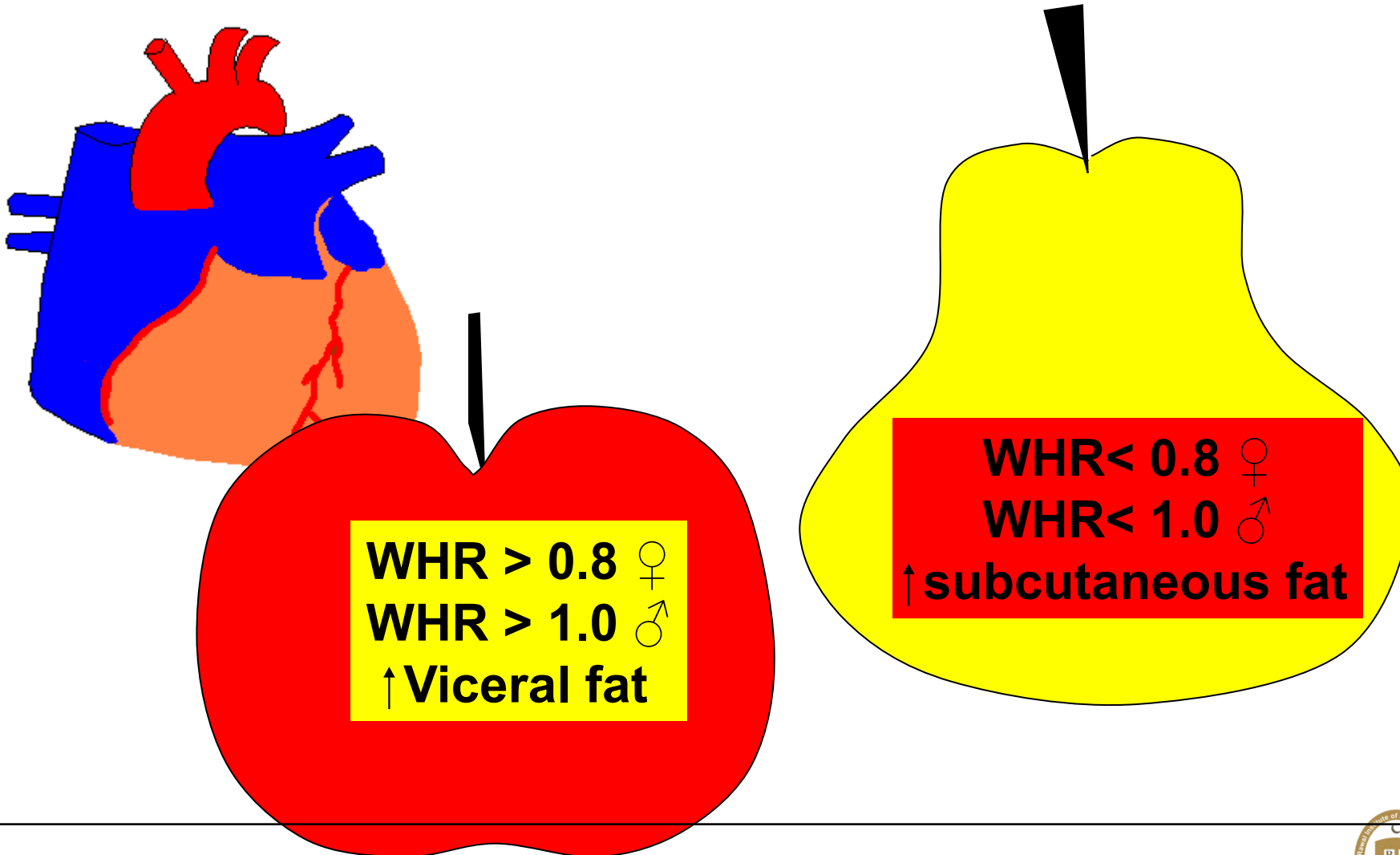
Mesenteric

Omental

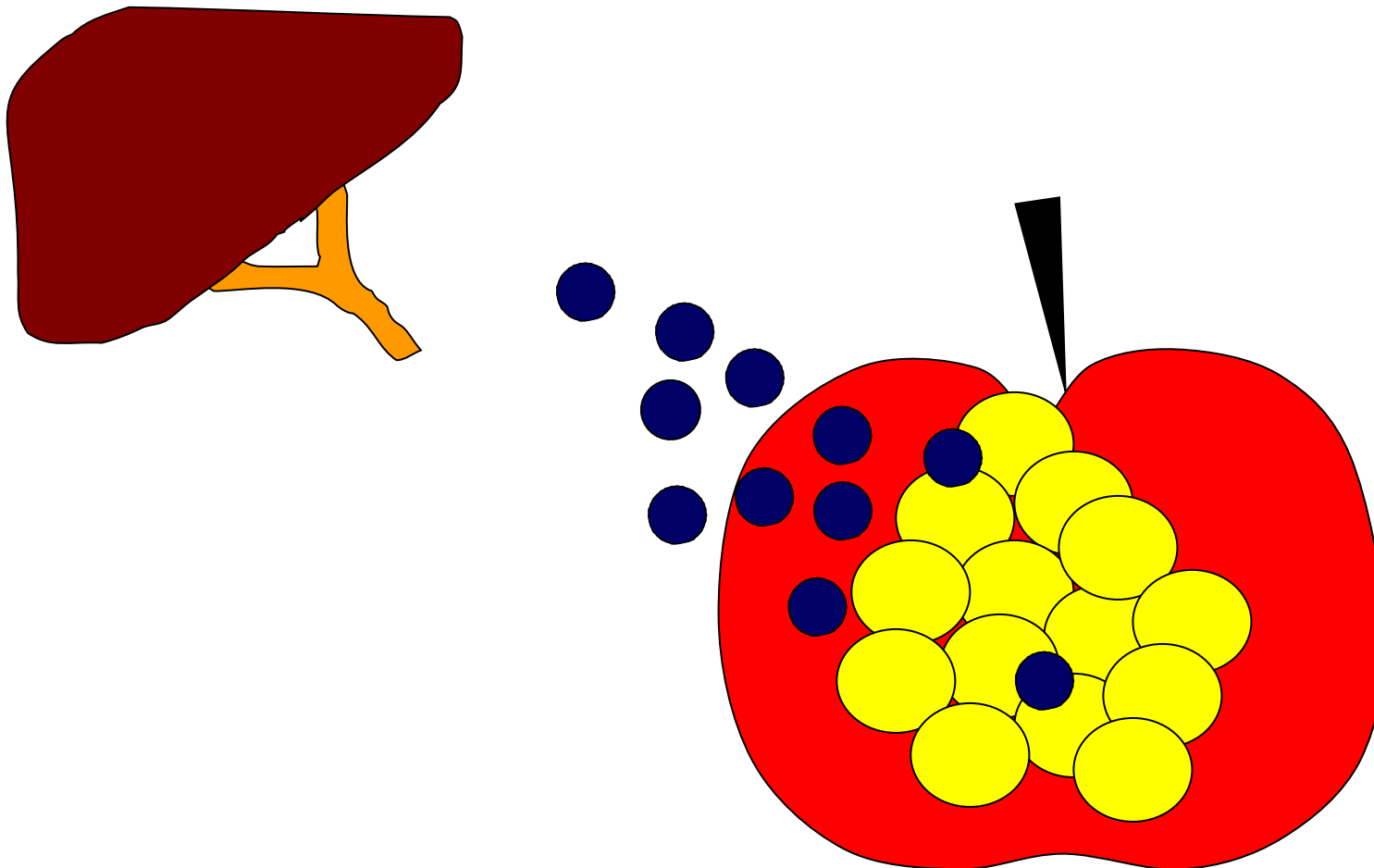
Obesity



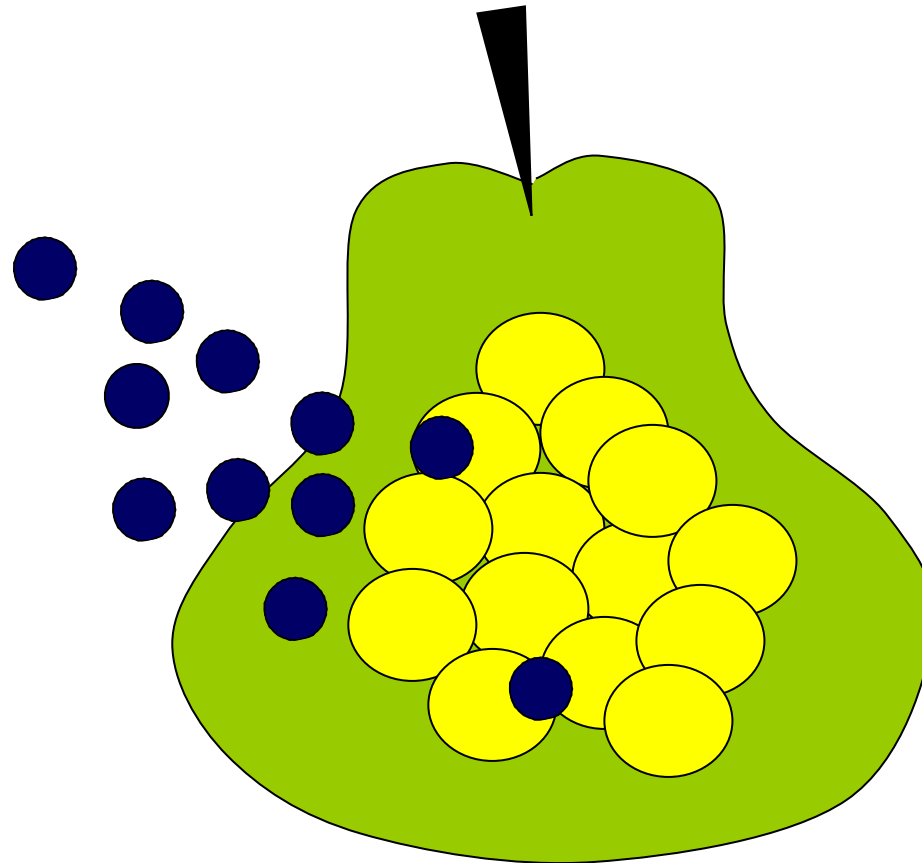
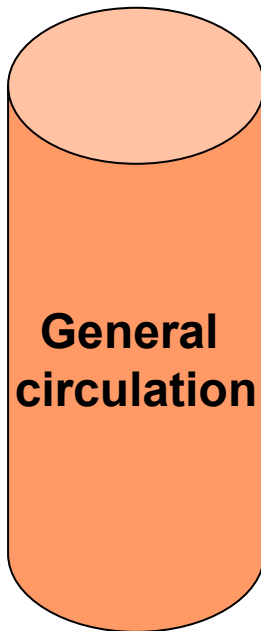
Android and Gynoid obesity



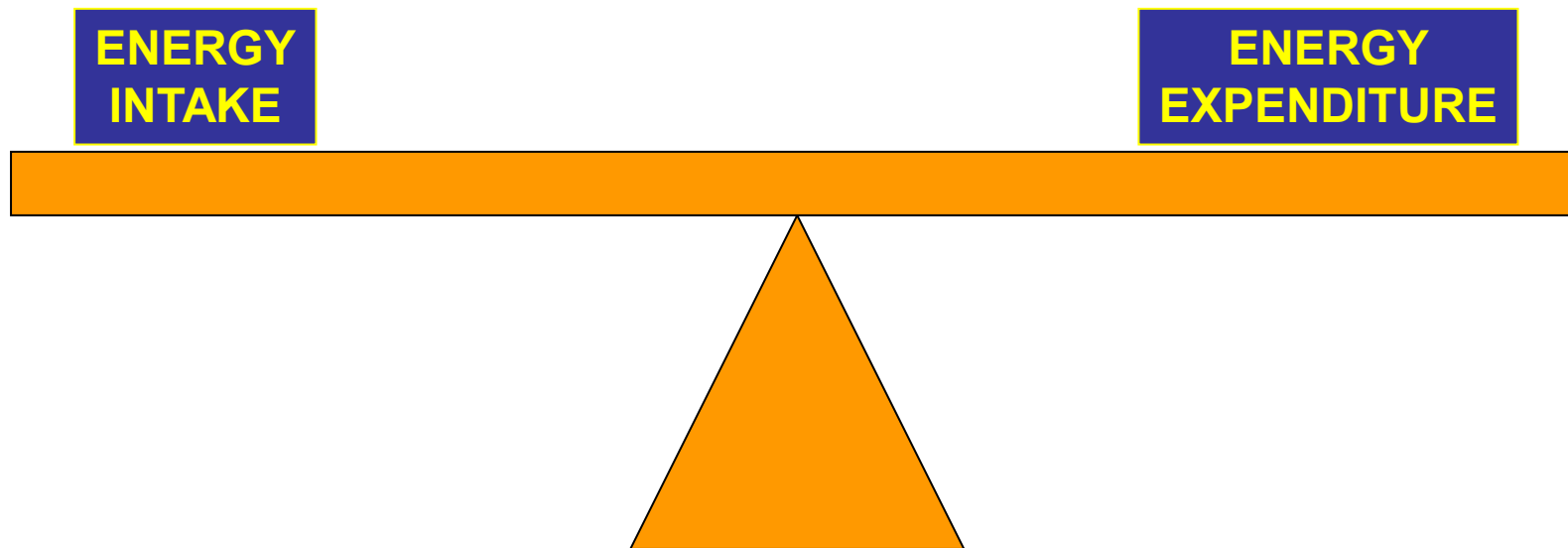
Android and gynoid obesity



Android and gynoid obesity



Body weight regulation



Factors contributing to obesity

- Genetic
 - Both parents obese → 70-80% chance
 - Both parents lean → 9% chance
 - Identical twins → same BMIs
 - Complex polygenic disease
- Environmental
 - Energy rich dense foods
 - Sedentary lifestyle

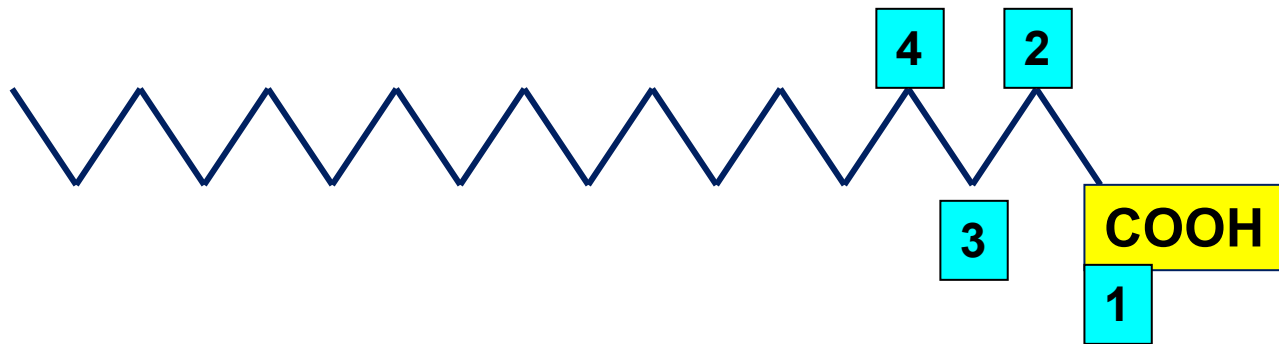
Metabolic changes in obesity

- Metabolic syndrome
 - Glucose intolerance
 - Insulin resistance
 - Hyperinsulinemia
 - Dyslipidemia (low HDL and elevated VLDL)
- Dyslipidemia

Reducing body weight

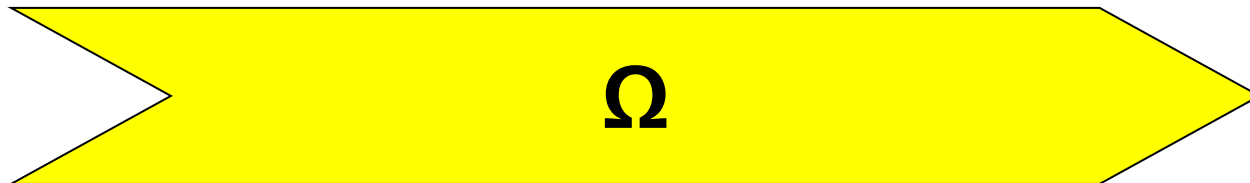
- Physical activity
- Caloric restriction
 - One lb of adipose = 3500 kcal
- Pharmacological
 - Sibutramine
 - orlistat
- Surgical treatment

Stearic acid



n or Δ

Stearic acid



Introduction of double bonds

