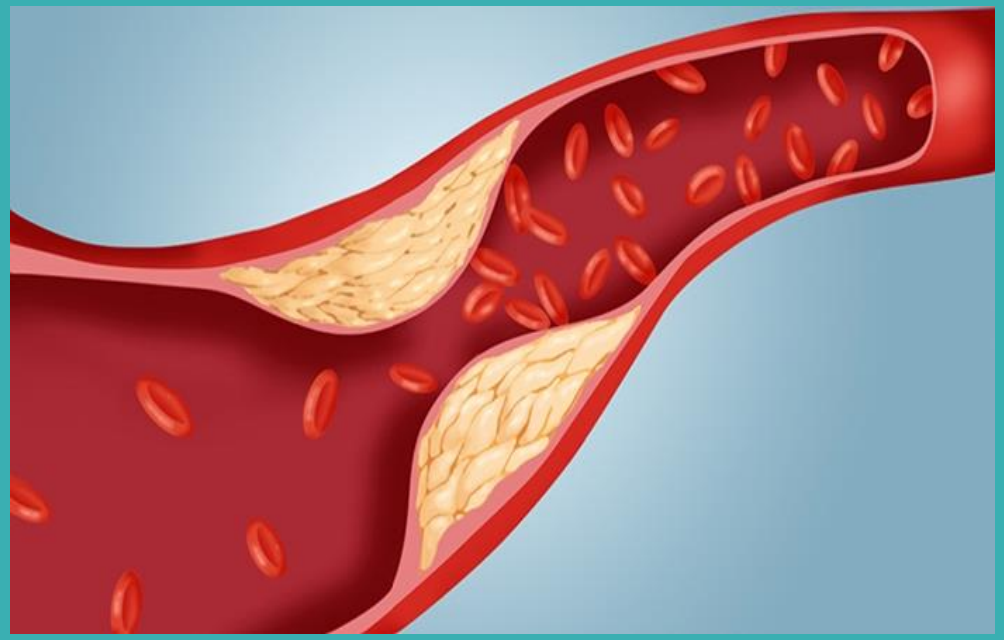
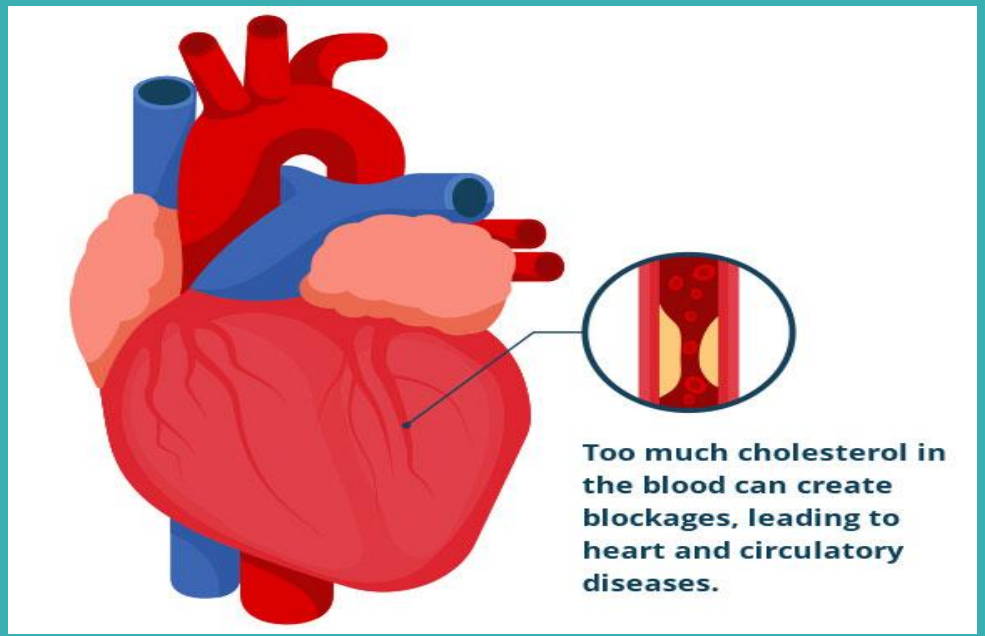
Medical Investigation

Lipid Profile





Overview

Lipids are a group of fats and fat-like substances that are important constituents of cells and sources of energy. Monitoring and maintaining healthy levels of these lipids is important in staying healthy.

Function

The results of the lipid profile are considered along with other known risk factors of heart disease to develop a plan of treatment and follow-up. Depending on the results and other risk factors, treatment options may involve lifestyle changes such as diet and exercise or lipid-lowering medications such as statins.

Why Lipid Profile tests ?!

- It is recommended that healthy adults with no other risk factors for heart disease be tested with a fasting lipid profile once every four to six years.
- If other risk factors are present or if previous testing revealed a high cholesterol level in the past, more frequent testing with a full lipid profile is recommended.
- Sample should be fasting 10 – 12 hrs before test

First Test
Serum Cholesterol
(s.chol)

Overview

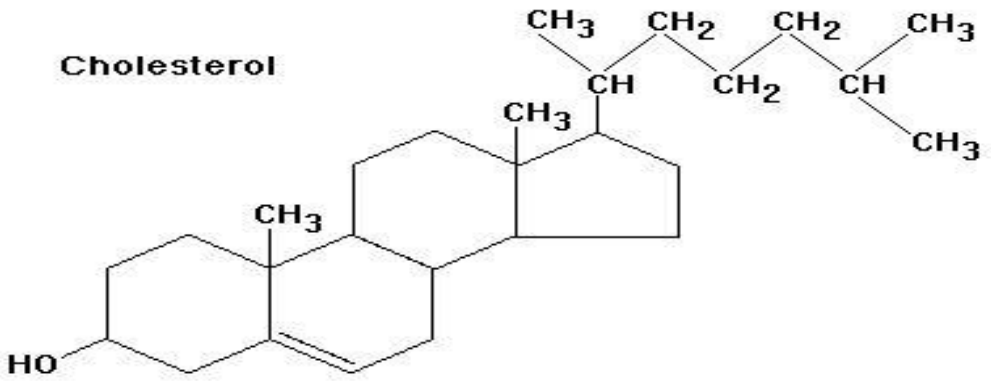
- Cholesterol is small molecule, one of the steroids. The human body contains about 100 g of cholesterol.

Sources

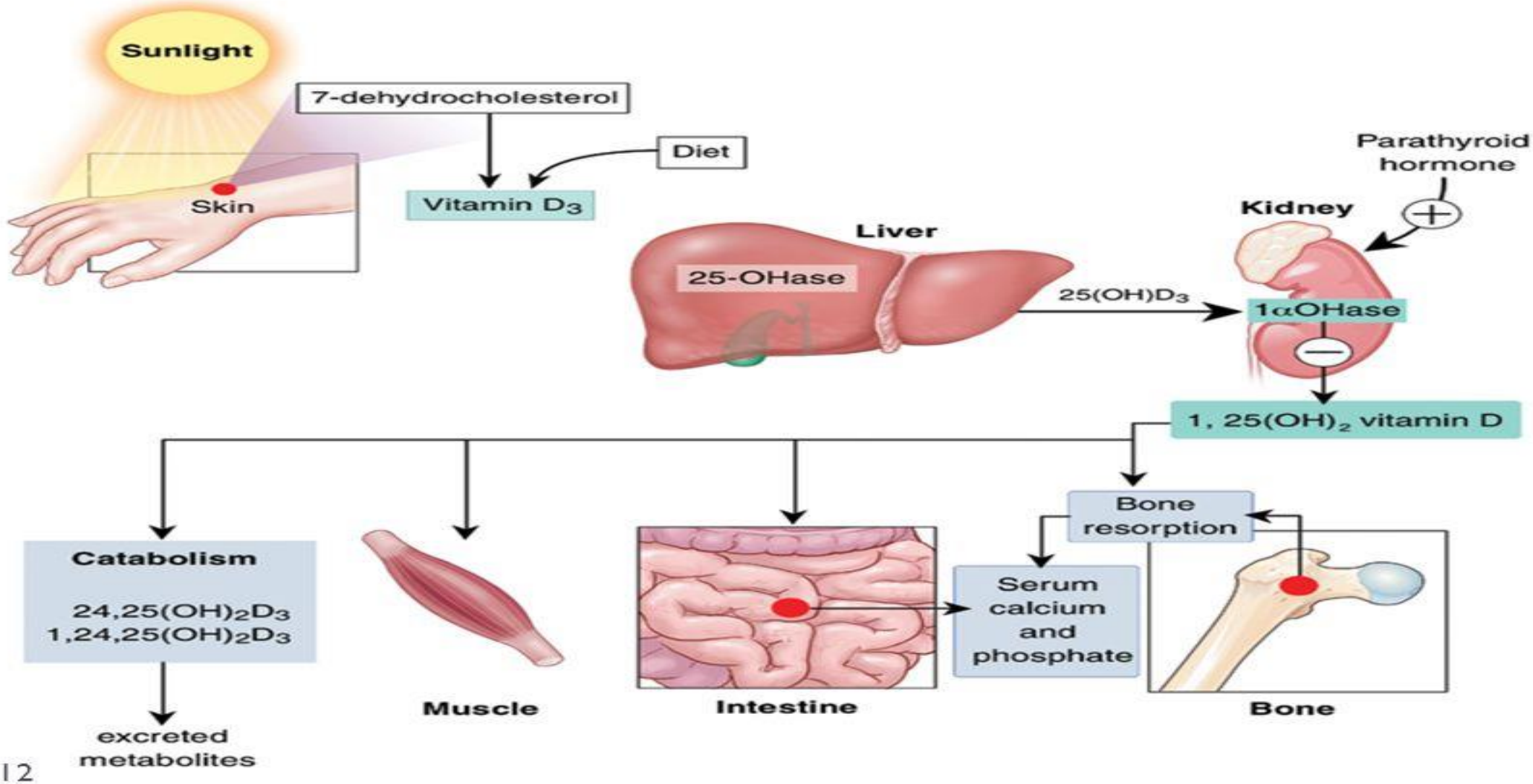
- Animal fats are complex mixtures of triglycerides, with lesser amounts of phospholipids and cholesterol. As a consequence, all foods containing animal fat contain cholesterol to varying extents. Major dietary sources of cholesterol include cheese, egg yolks, beef, pork, poultry, and shrimp.

Functions of Cholesterol

- Cell membranes
- Sex hormones
- Hormones released by the adrenal glands
- Production of bile acids
- Vitamin D



Metabolism Of Vitamin D



cholesterol is insoluble in blood

Then, How it is transported ?!

Lipoproteins

Lipoproteins

- A **lipoprotein** is a biochemical assembly that contains both proteins and lipids, bound to the proteins, which allow fats to move through the water inside and outside cells.

- The proteins serve to emulsify the lipid molecules.

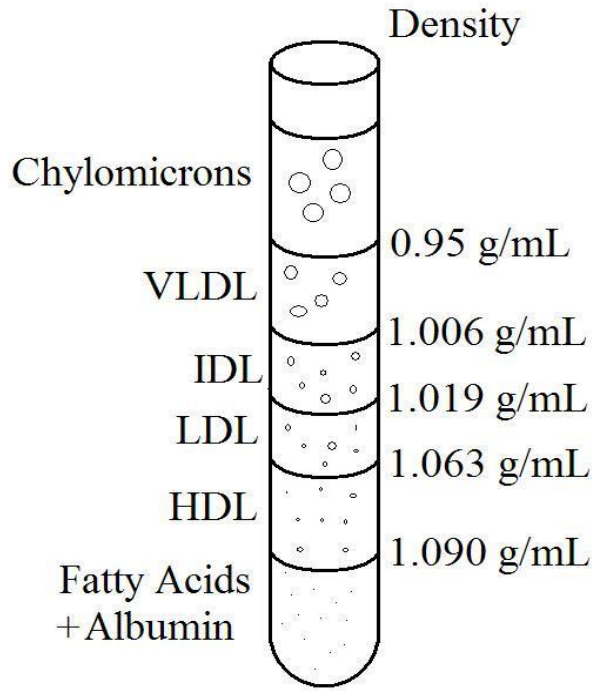
- Many enzymes, transporters, structural proteins, antigens, adhesins, and toxins are lipoproteins.

Types of Lipoproteins

– Classified according to density and electrophoresis migration

–Lipoproteins differ in their sizes, density, weights, chemical composition and artherogenicity (association with heart disease)

- lipoprotein classes
  - chylomicrons: take lipids from small intestine through lymph cells
  - very low density lipoproteins (VLDL)
  - intermediate density lipoproteins (IDL)
  - low density lipoproteins (LDL)
  - high density lipoproteins (HDL)



Major Groups of Plasma Lipoproteins

1- chylomicrons :

- consist of triglycerides, phospholipids, cholesterol, and proteins.
- They transport dietary lipids from the intestines to other locations in the body.

2- Very low density lipoproteins (VLDL)

- Most of the plasma VLDL are of hepatic origin. They are the vehicles of transport of triacylglycerol from the liver to the extra-hepatic tissues (endogenous lipids) .
- consist of triglycerides, phospholipids, cholesterol, and proteins.

3- Low-density lipoproteins (LDL)

- representing a final stage in the catabolism of VLDL
- carry cholesterol from the liver to other parts of the body where it can cause atherosclerotic disease.

4- High-density lipoproteins (HDL)

- involved in cholesterol transport and also in VLDL and chylomicron metabolism.
- HDL particles remove fat molecules from cells which want to export fat molecules.
- Increasing concentrations of HDL particles are strongly associated with decreasing accumulation of atherosclerosis within the walls of arteries.

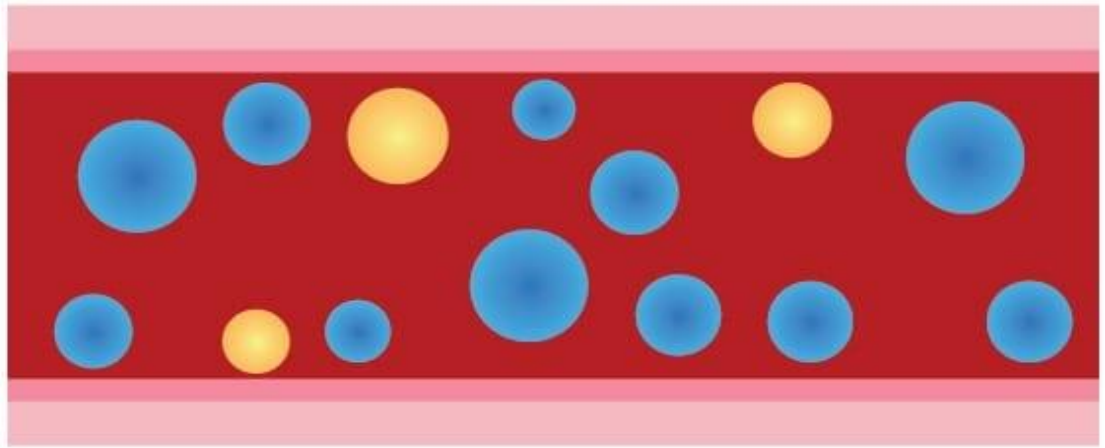
How to Calculate LDL Cholesterol?

- HDL & TGs are measured directly in the lab
- LDL can be calculated using a specific equation

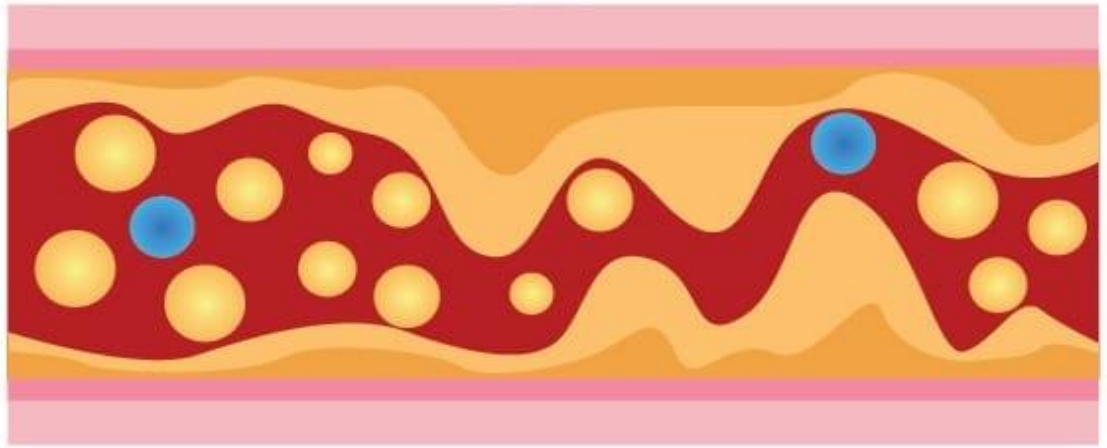
LDL-C = Total Cholesterol – (HDL-C + TG/5)

- If TG is > 400 mg/dl then this formula is not accurate & LDL must be measured directly in the lab

Cholesterol - Arteries



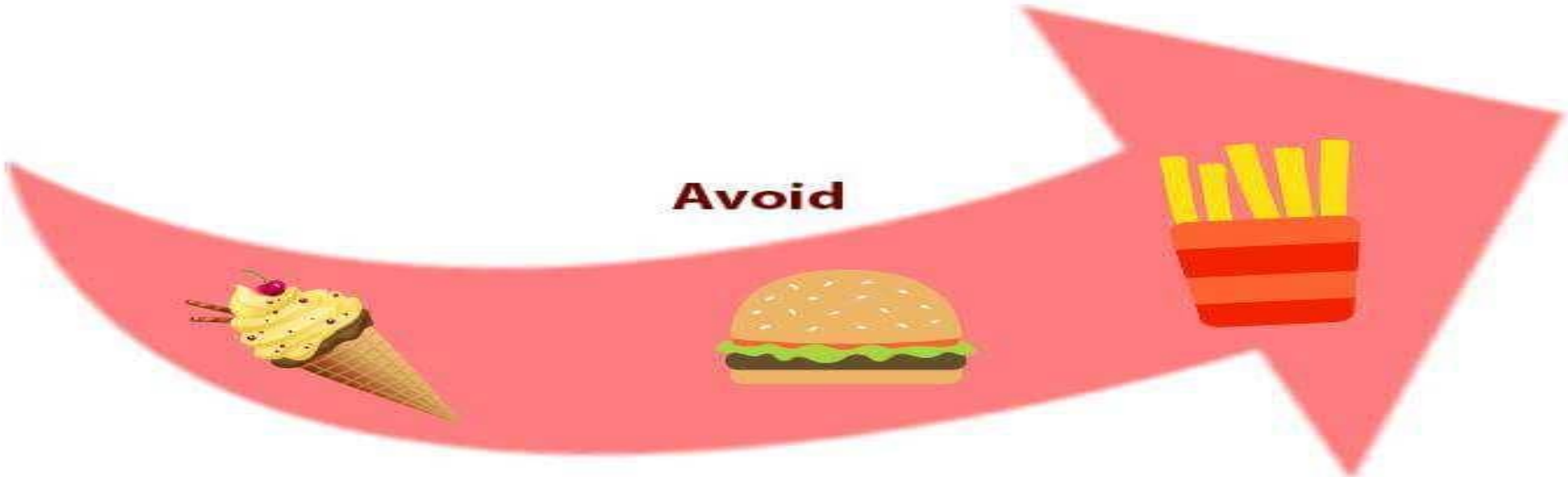
Normal Artery



Artery Narrowed

ACTIVHEALTH
TIPS

Good vs Bad Cholesterol



Second Test
serum Triglycerides (T.G)

Overview

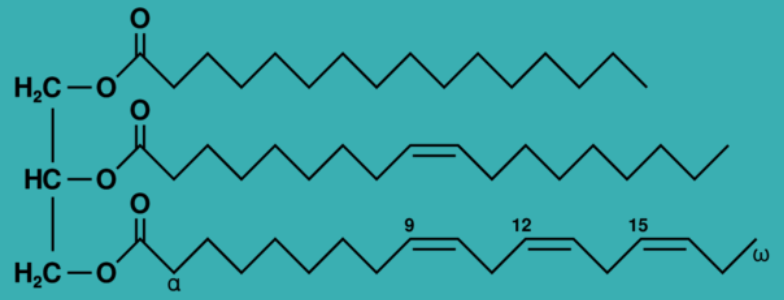
- (triacylglycerol, TAG or tri acyl glyceride) is an ester derived from glycerol and three fatty acids.

Sources

- Animal fats are complex mixtures of triglycerides.

- It is the main constituent of vegetable oil.
- Triglycerides are made by the body as a storage form for unused calories taken in through diet.

High levels of triglycerides, according to the American Heart Association, are associated with the development of atherosclerosis



Normal of lipid profile

cholesterol

Level mg/dL	Level mmol/L	Interpretation
< 200	< 5.0	Desirable level corresponding to lower risk for heart disease
200–240	5.2–6.2	Borderline high risk
> 240	> 6.2	High risk

triglyceride

Level mg/dL	Level mmol/L	Interpretation
<150	<1.69	Normal range, lowest risk
150-199	1.70-2.25	Borderline high
200-498	2.25-5.63	High
>500	>5.65	Very high, increased risk

HDL

Level mg/dL	Level mmol/L	Interpretation
<40	<1.03	Low HDL cholesterol, heightened risk for heart disease, <50 is the value for women
40-59	1.03-1.52	Medium HDL level
>60	>1.55	High HDL level, optimal condition considered protective against heart disease

LDL

LDL = TC - HDL - TG/5.0 (mg/dL)

Level mg/dL	Level mmol/L	Interpretation
<100	<2.6	Optimal LDL cholesterol, corresponding to reduced, but not zero, risk for heart disease
100 to 129	2.6 to 3.3	Near optimal LDL level
130 to 159	3.3 to 4.1	Borderline high LDL level
160 to 189	4.1 to 4.9	High LDL level
>190	>4.9	Very high LDL level, corresponding to highest increased risk of heart disease

cardiac risk ratios

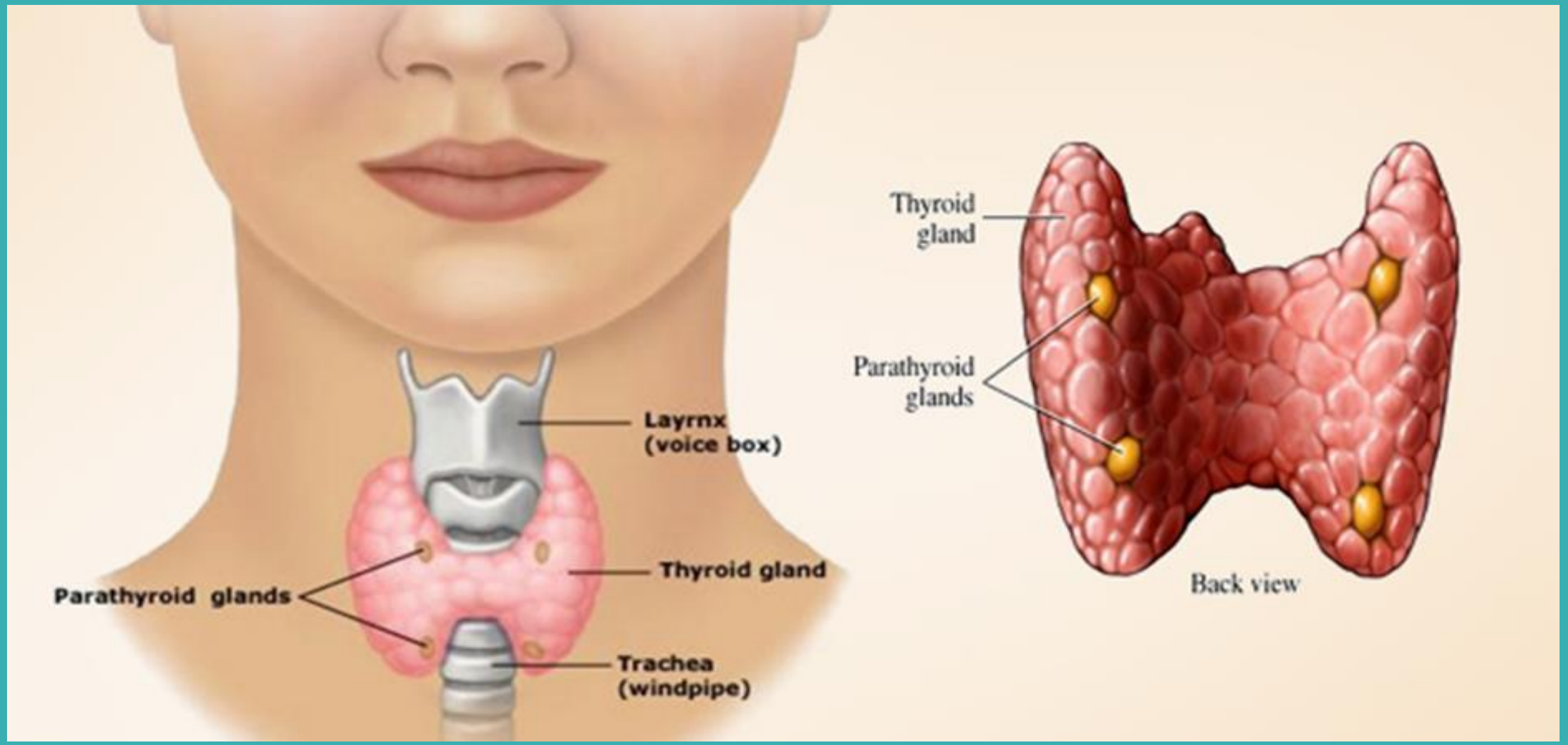
cardiac risk ratio	Interpretation
Total cholesterol / HDL cholesterol	*(Low risk 3.3- 3.9)* *(Average risk 3.9-5.0)* *(Moderate risk 5.0-9.6)* *(High risk 9.6 -23.4)*
LDL cholesterol / HDL cholesterol	*(Low risk 0.5-3.0)* *(Moderate risk 3.0-6.0)* *(High risk >6.0)*

Interpretation of cholesterol

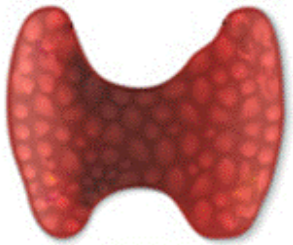
- Hypercholesterolemia
- Hypocholesterolemia

Break Time

Thyroid Gland



Thyroid Gland



T3

Heart function

Digestion

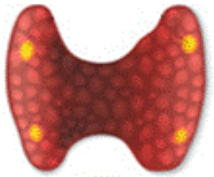
Brain development and nervous system

T4

Bone health

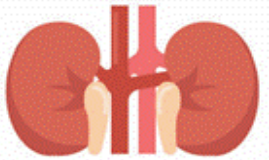
Muscle contractions

Calcitonin



Parathyroid hormone production

Bone health

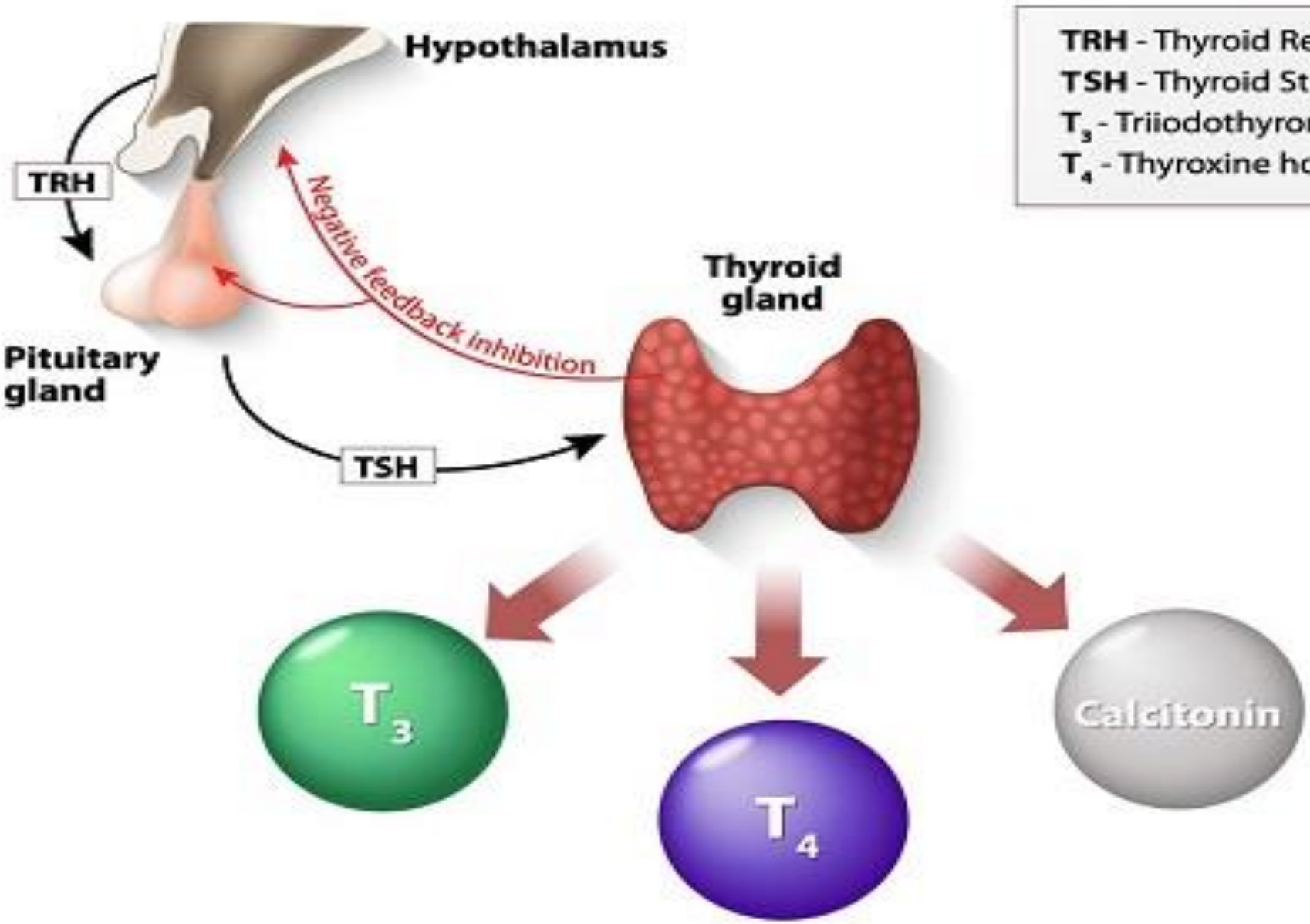


Kidney clearance rate

Thyroid tests

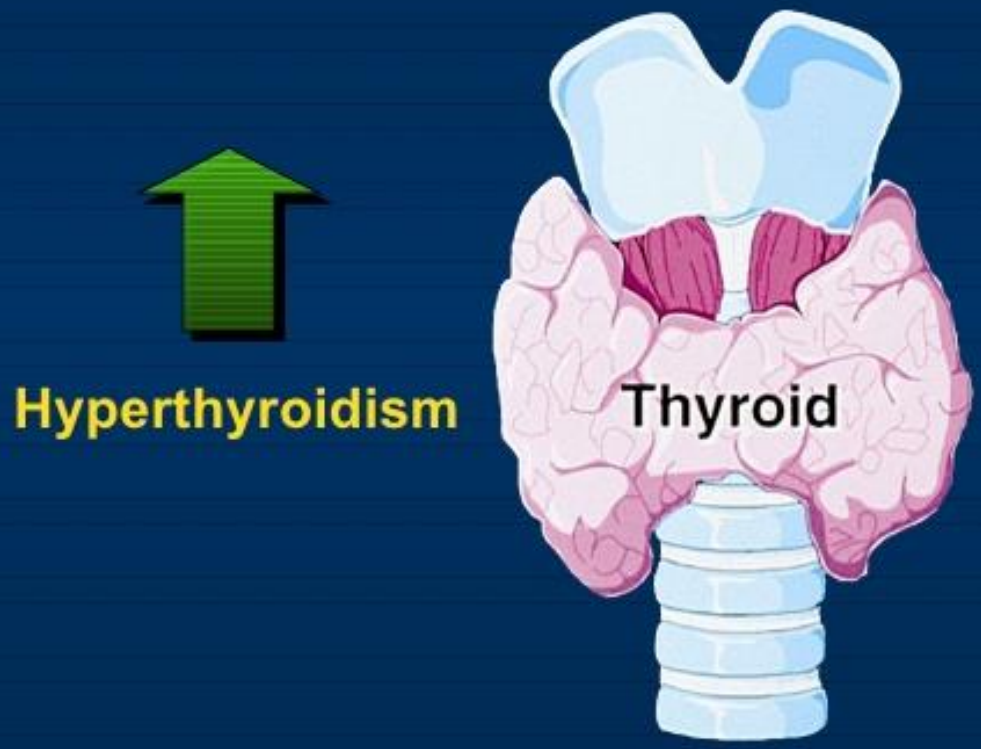
- TSH
- Total T3,free T3
- Total T4,free T4

THYROID HORMONES



TRH - Thyroid Releasing Hormone
TSH - Thyroid Stimulating Hormone
T_3 - Triiodothyronine hormone
T_4 - Thyroxine hormone

When the Thyroid Doesn't Work



Hyperthyroidism

Hypothyroidism

Hypothyroid

- Hair loss
- Fatigue
- Sensitivity to cold
- Constipation
- Increased cholestrol
- Weight gain
- Dry skin

Hyperthyroid

- Fine, brittle hair
- Trouble sleeping
- Excessive sweating
- Weight loss
- High blood pressure
- Anxiety
- Moist skin

Hypothyroidism is underactive thyroid

Thyroid gland under-produces the Thyroid Stimulating Hormone.

Hyperthyroidism is overactive thyroid

Thyroid gland over-produces the Thyroid Stimulating Hormone.

Random Blood Glucose		76	mg/dL	Normal : 70 - 139 Prediabetes : 140 - 199 Diabetes : More than 200
Haemoglobin A1C		5.6	%	Normal: Less than 5.7 Prediabetes: 5.7 - 6.4 Diabetes: More than 6.4
Inflammatory Markers				
C-Reactive Protein (Quantitative)	↑	5.1	mg/L	0 - 5
Liver Function Tests				
SGPT (ALT)	↑	46	U/L	7 - 40
SGOT (AST)		20	U/L	0 - 34
Alkaline Phosphatase		63	U/L	46 - 116
Serum Albumin	↑	5.1	g/dL	3.2 - 4.8
Kidney Function Tests				
Serum Uric Acid		6.1	mg/dL	3.5 - 7.2
Iron Profile				
Ferritin		111	ng/mL	20 - 250
Thyroid Function Tests				
TSH		2.99	uIU/mL	0.55 - 4.78

N.B. :Many factors affect TSH levels including circadian rhythm (peak around midnight and a low in the afternoon), diet (High-Fiber Diet or Goitrogenic Foods), thyroid therapy, autoimmune thyroiditis and stress. Such factors act as Non-thyroidal illness affecting TSH levels without any effect on thyroid gland.

Free T3		3.6	pg/mL	2.1 - 4.4
Free T4		1.3	ng/dL	0.8 - 1.8

That’s all for today ☺

Thanks for attention