Lecture 82:

Nutritional Approach To Common Endocrine Disorders

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The Three Common Disorders:

- **Diabetes.**
- **High LDL and Triglycerides**
- **Low Function Thyroid.**

Diabetes Mellitus:

- **Diabetes Mellitus (DM) is a chronic metabolic disorder.**

- **It is characterized by impaired metabolism of carbohydrates, proteins, and fats, resulting in an elevation of blood sugar level.**

- **Compared to DM, there is another type of diabetes called as "*Diabetes Insipidus*". In diabetes insipidus, blood sugar (glucose) level does not increase and glucose does not appear in urine.**

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There are two types of DM:

- **DM type I is due to lack or decreased release of insulin from the pancreas.**

- **It is about 10 % of all diabetes, appears at younger ages, insulin level is very low, insulin resistance is rare, and they would always need insulin.**

- **DM type II is about 90% of diabetes.**

- **People with DM type II usually have normal and even higher levels of insulin, but insulin resistance is very common.**

- **It often appears at later ages and can be controlled by diet, exercise, and medications.**

- **They might need insulin at the later stages of the disease.**

- **Signs and symptoms of diabetes are fatigue, tiredness, polyuria (frequent urination), polydipsia (increased thirst), polyphagia (increased hunger), frequent urinary tract infections, weight loss, weight gain, and fungal infections.**

- **People with diabetes are at greater risk for heart disease, stroke, kidney disease, eye problems, depression, and neurological dysfunction.**

Contributing factors include:

- **Genetics.**
- **Obesity.**
- **Diseases of the exocrine pancreas:**
  - **Inflammation of pancreas (pancreatitis).**
  - **Tumors of the pancreas.**
  - **Cystic fibrosis.**
  - **Hemochromatosis.**
- **Infections: congenital rubella, cytomegalovirus, and coxsackie virus.**

- **Endocrine disorders:**
  - **Acromegaly.**
  - **Cushing`s syndrome.**
  - **Hyper function thyroid.**
  - **Tumor of the adrenal glands.**
  - **Gestational diabetes.**
  - **Polycystic ovarian syndrome.**
- **Medications: corticosteroids, pentamidine, nicotinic acid, thiazides, hydantoin, protease inhibitors, diazoxide, and alpha-interferon.**

- **Chromosomal disorders: Down`s syndrome, Klinefelter`s syndrome, and Turner`s syndrome.**
- **Chronic stress.**
- **Nutritional deficiencies, especially chromium, vanadium, zinc, vitamin A, vitamin D, and vitamins B.**

Banned Foods:

- Sugars and sweets.
- Saturated and Trans fats.
- Alcoholic beverages.
- Carbonated beverages.
- Refined foods.
- Process foods.
- Food colorings, flavourings, additives and preservatives.
- MSG (monosodium glutamate)-containing foods.

- **Foods with GI (glycemic index) over 55, for example, white rice, and white bread.**
- **Cow`s milk.**

Recommended Foods:

- Drink plenty of water: at least 2 liters a day.
- Whole grains.
- Foods high in fiber: lentils, beans, avocado, and artichoke.
- Alkaline diet.
- Foods high in omega-3: fish, flaxseeds, chia, and hemp seeds.

- **<u>Fruits and vegetables high in flavonoids:</u> berries, red grapes, grapefruit, pomegranate, sea buckthorn, persimmon, kiwi, beets, basil, garlic, parsley, radish, radicchio, rhubarb and parsnips.**

- **Garlic.**
- **Onion.**
- **Foods with GI less than 55 (see Glycemic Index).**
- **Lean protein: fish, turkey, chicken, and egg whites.**
- **Cinnamon.**
- **Turmeric.**
- **Ginger.**
- **Chlorella and spirulina.**

- **Reishi mushroom.**
- **Bitter melon. This unique fruit contains blood sugar-lowering compounds, charantin and insulin-like polypeptide.**
- **Green tea.**

Recommended Supplements:

- **French Maritime Pine Bark Extract: 100 – 300 mg a day. It is a powerful antioxidant that can lower blood sugar, bad cholesterol, and blood pressure. French Maritime Pine Bark Extract may protect the eyes from diabetic complications.**

- **Grape seed extract: 100 – 200 mg a day. It lowers blood sugar level and has a protective effect on the eyes against diabetes.**

- **Omega – 3 fatty acids: 1000 – 1500 mg a day. *Caution:* high doses of Omega-3 in people with diabetes type II may actually elevate blood sugar level by aggravating insulin resistance. Adding vitamin E may prevent from this adverse effect.**

- **Chromium picolinate: 500 – 1000 mcg. It improves glucose tolerance and fights insulin resistance.**

- **Vanadium: 10 – 30 mg a day. It helps control blood sugar by mimicking the effects of insulin.**

- **Zinc:** 50 – 100 mg a day. It is a key mineral for normal function of insulin.

- **Resveratrol:** 200 – 400 mg a day. It is a powerful antioxidant that helps lower blood sugar level and also reduces risk of heart diseases.

- **Alpha lipoic acid (ALA):** 500 – 1000 mg a day. ALA reduces insulin resistance and may alleviate symptoms of neuropathy in diabetic patients.

- **Spirulina:** Spirulina: as a tablet: 2000 – 3000 mg a day, or as a powder: 2 – 3 teaspoons a day. Spirulina is a powerhouse of nutrients.

- **Aloe Vera Juice:** ¼ to ½ cup three times a day. It has a healing effect and provides variety of micronutrients.

- **Co – Enzyme Q10:** 100 – 300 mg a day. It a potent antioxidant that protects from heart disease, lowers blood pressure, and reduces bad cholesterol.

- **Magnesium:** 200 – 600 mg a day. It improves function of insulin.
- **Vitamin E:** 400 – 800 IU a day.
- **Vitamin D:** 2000 – 5000 IU a day.
- **Vitamin C:** 2000 – 3000 mg a day.

- **Glucomannan: 4 – 10 grams a day. It is a water soluble fiber that helps control blood sugar and cholesterol. It may be used in weight management and constipation as well.**

- **L – Carnitine: 1000 – 3000 mg a day. It may prevent from diabetic retinopathy and also helps lower cholesterol.**

- **PGX: 3000 – 4500 mg a day. It is a water-soluble fiber that helps lower blood sugar and cholesterol levels.**

- **Evening primrose oil: 3000 – 6000 mg a day. It contains GLA (gamma-linolenic acid) and may prevent from diabetic nephropathy.**

- **Fenugreek:** 10 – 40 grams a day, or as tincture 3 – 4 ml up to three times a day. This herb helps lower blood sugar and triglyceride levels. The active ingredients responsible for its benefits are trigonelline, lysine, L-tryptophan, and saponins.

- **Ginkgo Biloba:** 120 – 240 mg a day. It improves blood circulation and is useful in diabetic retinopathy.

- **Psyllium:** 5 – 20 grams a day. It is a bulk-forming laxative that contains insoluble fiber and mucilage. It is generally used for constipation, and it may reduce cholesterol and blood sugar levels as well.

- **Digestive enzymes:** A full spectrum product.

- **Probiotics:** a product that provides 15 to 20 billion organisms per serving.

- **Vitamin B – Complex:** A high potency product.

Miscellaneous Suggestions:

- Exercise.
- Weight management.
- Acupuncture.
- Liver detoxification.
- Colon cleansing.

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- **Banaba leaf extract:** **16 - 48 mg a day. The active ingredients in this tropical plant are corosolic acid and valoneic acid. Corosolic acid mimics insulin and increases glucose uptake in fat cells.**

- **Cinnamon extract:** **500 – 1500 mg a day. It helps lower blood sugar level by improving insulin sensitivity.**

- **Green tea extract:** **150 – 300 mg a day.**

- **Benfotiamine:** **300 – 600 mg a day.**
  Benfotiamine is a fat-soluble form of thiamine (vitamin B1) and has protective effects against complications of diabetes (nephropathy, neuropathy, and retinopathy).

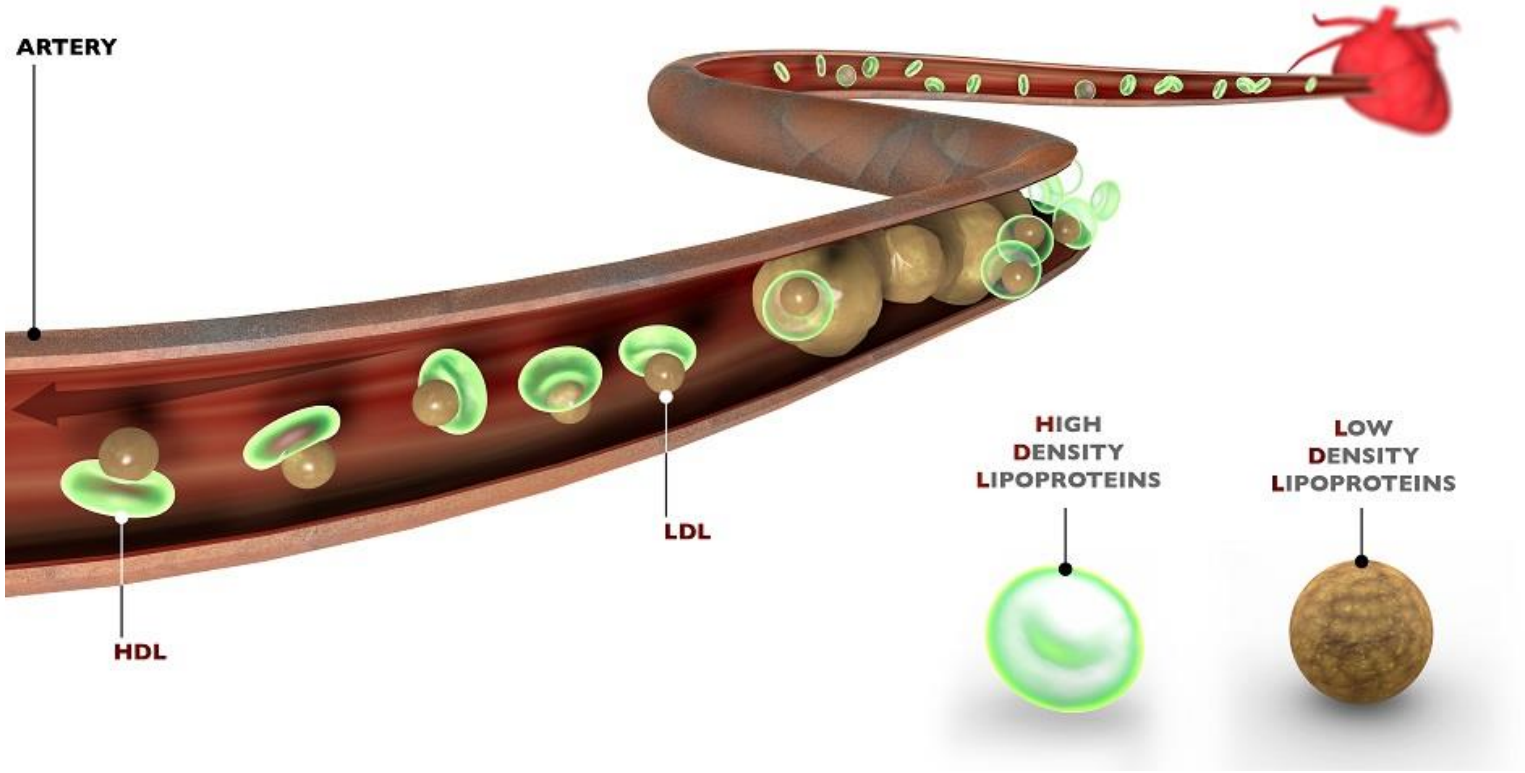
- **Asian ginseng: 200 – 400 mg a day. Known also as panax ginseng, it may help lower blood sugar level and has a blood flow-enhancing effect as well.**

- **Astaxanthin: 6 – 12 mg a day. It is a potent antioxidant that has a protective effect against oxidative stress and diabetic retinopathy.**

High Cholesterol and Triglyceride:

- **Cholesterol and triglyceride (TG) are normally present both in the body and foods.**
- **Cholesterol is an important part of cell membranes.**
- **Also all male and female hormones are chemically made from cholesterol.**

- **Lipoproteins are large molecules that transport lipids (cholesterol and triglyceride) and fat-soluble vitamins from the liver and intestine to the tissues and vice versa.**



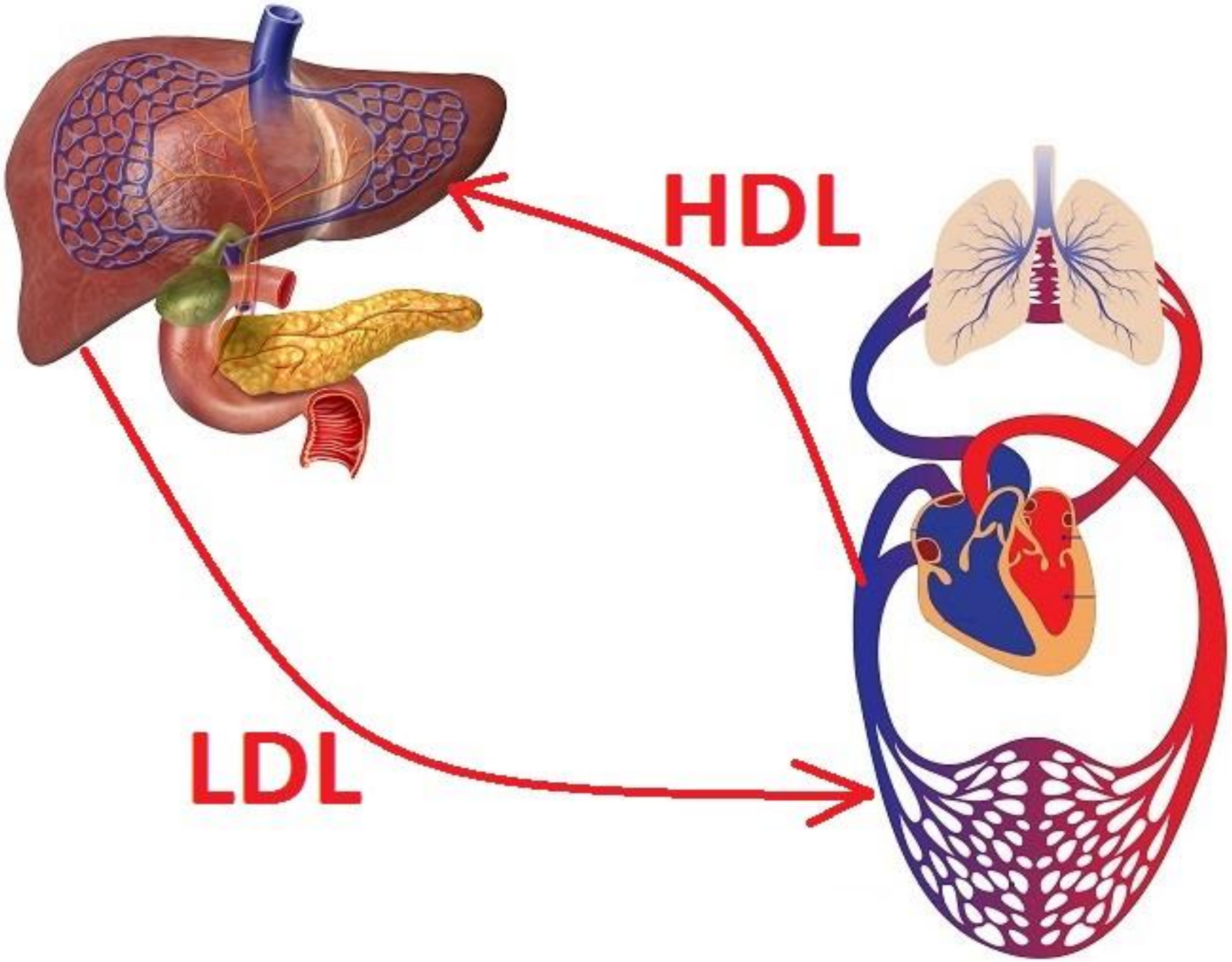
The lipoproteins in the blood are classified into five major classes based on their relative densities:

- **Chylomicron**
- **Very low-density lipoprotein (VLDL)**
- **Intermediate-density lipoprotein (IDL)**
- **Low-density lipoprotein (LDL)**
- **High-density lipoprotein (HDL)**

- **Most triglyceride is carried in chylomicron and VLDL, and most cholesterol is transported in LDL and HDL.**

- **Cholesterol is transported by LDL from the liver to the tissues, and it is carried back to the liver and intestine by HDL.**

- **This is why LDL and HDL are often called as *bad cholesterol* and *good cholesterol*, respectively.**


HDL
LDL

- **An increase in the blood levels of LDL and TG and a decrease in the blood level HDL would increase the risks of cardiovascular diseases.**

Fats	Normal Levels in the Blood
Total Cholesterol	Below 200 mg/dl
LDL	Below 100 mg/dl
HDL	35 – 60 mg/dl
Triglyceride	Below 150 mg/dl

Potential causes of high levels of LDL and TG:

- **1) Genetics and familial.**
- **2) Dietary factors:**

- Diets high in cholesterol, saturated and Trans fats.

- Diets high in carbohydrates.

- Diets high in calories.

- Diets low in fiber.

- Diets low in essential fatty acids.

- **3) Sedentary life style and lack of physical activities.**

- **4) Stress.**
- **5) Medical conditions:**

- diabetes

- hypothyroidism

- cholestasis

- nephrotic syndrome

- anorexia nervosa

- Cushing’s syndrome

- hepatoma (liver tumor)

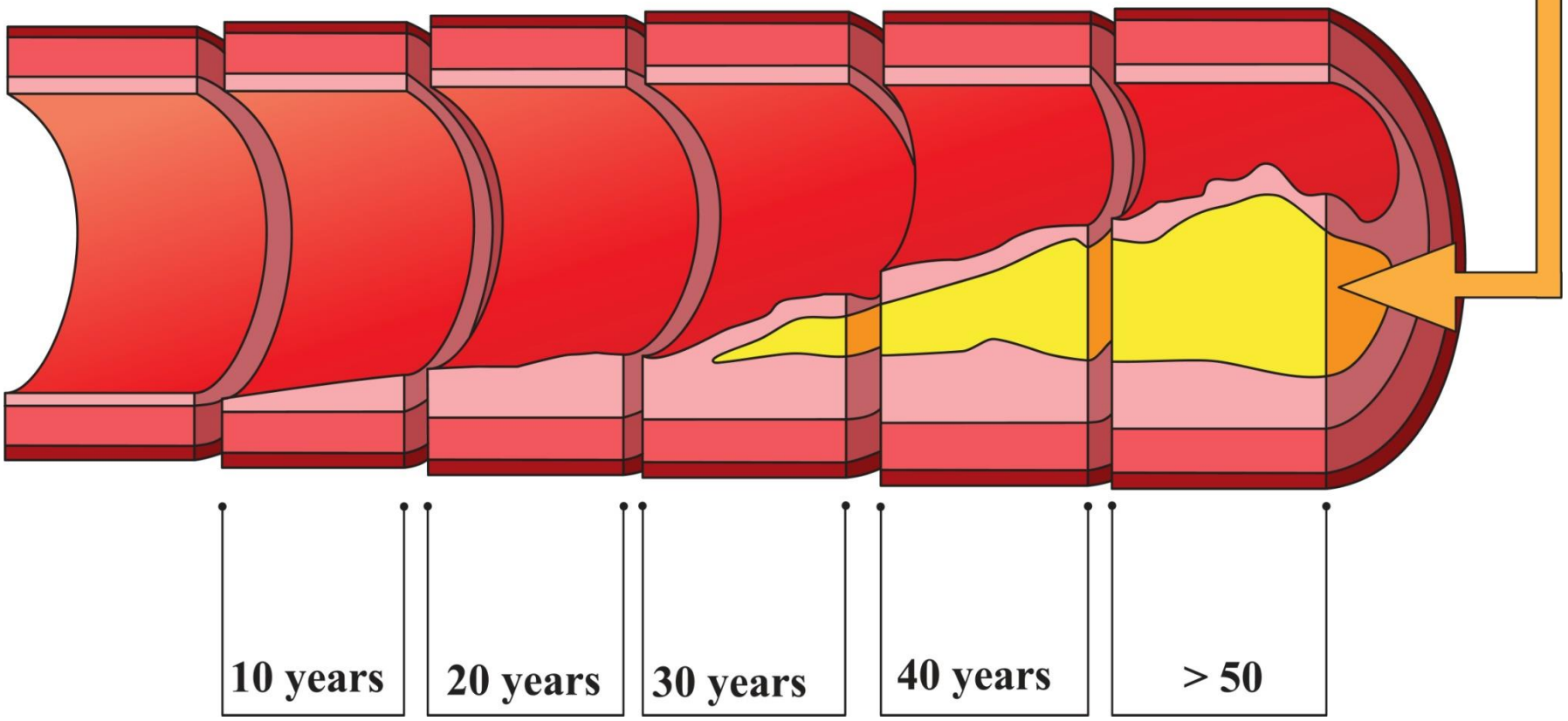
- **Since the liver is the principle site of formation and clearance of lipids, liver diseases could have different impacts on lipid profiles.**

- ***Hepatitis increases the level of TG slightly, while severe hepatitis and liver failure are associated with a significant decrease in the blood levels of cholesterol and TG due to a decrease in liver ability to synthesize lipoproteins.***

- **6) Medications: thiazides, cyclosporin, and tegretol.**
- **7) Alcohol and estrogen increase TG level. *Estrogen and regular alcohol consumption increase both VLDL and HDL.***

Triglyceride level should be monitored in regular alcohol users, when taking birth control pills, and during postmenopausal hormone replacement therapy.

Accumulation of cholesterol in the vascular wall - atherosclerotic plaque



Potential causes of low level of HDL:

- 1) Diabetes type II.
- 2) Obesity.
- 3) Smoking.
- 4) Lack of exercise.
- 5) Medical conditions: Gaucher`s disease.
- 6) Medications: anabolic steroids, and beta-blockers.
- 7) Malnutrition.

Restricted Foods:

- Saturated, hydrogenated, and Trans – fats.
- Sugars and sweets.
- Fried foods.
- Processed foods.
- High GI foods.
- Sodas.
- Alcohol.
- High fat dairy products.

Fast foods and foods high in saturated fats and calories increase blood level of LDL cholesterol, which leads to heart disease.

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- **Egg yolk. A medium egg yolk contains 210 mg of cholesterol.**
- **Pork.**
- **Beef liver.**
- **Shrimp. 100 grams (3 oz) of shrimp provide about 190 mg of cholesterol.**
- **Vegetable shortenings (shortening is a fat that is solid at room temperature and is used in cooking, baking, grilling and making pastries).**

Recommended Foods:

- **Drink plenty of water: at least 2 liters a day.**
- **Whole grains.**
- **Foods high in fiber: lentils, beans, avocado, oats, and artichoke.**
- **Foods high in omega-3: fish, flaxseeds, chiaseeds, and hemp seeds.**

- **<u>Fruits and vegetables high in flavonoids:</u> berries, red grapes, grapefruit, pomegranate, sea buckthorn, persimmon, kiwi, beets, basil, garlic, parsley, radish, radicchio, rhubarb and parsnips.**

- **Garlic.**
- **Onion.**
- **Foods with GI less than 55 (see Glycemic Index).**
- **Nuts.**
- **Spices: cinnamon, turmeric, oregano, basil, cayenne, sumac, and rosemary.**
- **Ginger.**
- **Chlorella and spirulina.**
- **Olive oil.**

- **<u>Fruits and vegetables high in phytosterols:</u> acai berry, goji berry, lemon, persimmon, plum, sea buckthorn, strawberry, alfalfa sprouts, amaranth, avocado, beets, bell pepper, cabbage, celery, cucumber, eggplant, onion, potatoes, pumpkin, tomatoes, turnip, turnip greens, and yams.**
- **Green tea.**
- **Maitake mushroom. It contains beta-D-glucan that lowers both LDL and TG.**
- **Soy products.**

Recommended Supplements:

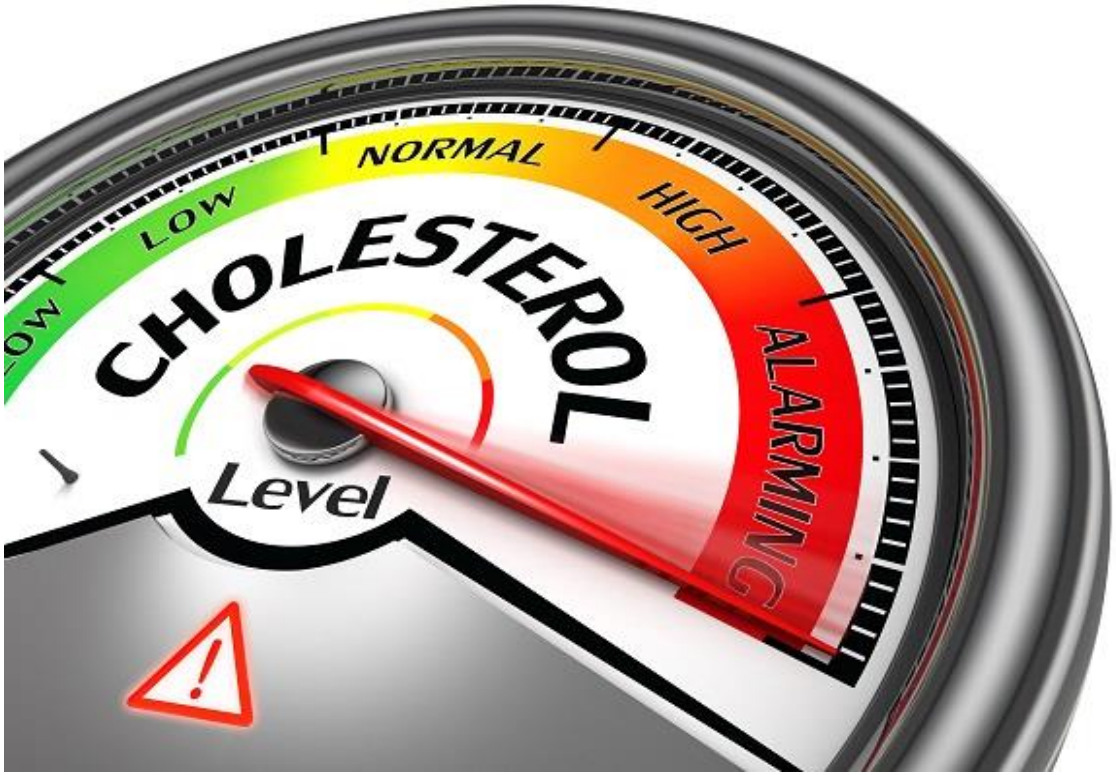
- **Niacin (vitamin B3): 1000 – 3000 mg a day. Niacin lowers LDL and TG and increases HDL. The most frequent side effect of niacin is skin flushing, which is mediated by the release of prostaglandins D2 and E2.**

The skin flushing is a harmless but bothersome reaction that usually starts within 10 – 20 minutes after taking niacin and often lasts up to 30 minutes.

Flushing can be reduced by one of the followings:

- **1) starting at lower doses and gradually increasing to higher doses.**
- **2) taking no-flush or sustained-released forms.**
- **3) taking 300 mg of aspirin about 30 minutes before taking niacin.**
- **4) taking 200 – 400 mg of Advil per day.**
- **5) taking niacin along with meals.**

- ***CAUTION*: niacin should not be taken by people with <u>peptic ulcer</u> and <u>liver disease</u>. It can also raise uric acid level, increasing risk of attacks in gout, and fasting blood sugar level.**



- **French Maritime Pine Bark Extract: 100 – 200 mg a day. It is a potent antioxidant that can help lower blood sugar and LDL levels.**

- **Grape seed extract: 50 – 100 mg a day.**

- **Omega – 3 fatty acids: 3 – 4 grams a day. Omega-3 lowers TG level. It may increase LDL level in some patients and garlic supplement may prevent from this.**

- **Beta – Glucan:** 3 – 10 grams a day. Beta-glucan is a type of fiber found in oats, barley, and maitake mushroom and can lower cholesterol.

- **HMB (beta-Hydroxy beta-Methyl Butyrate):** 1 – 3 grams a day. It is the metabolite of the amino acid lucine and naturally can be found in catfish, grapefruit, and alfalfa. It can lower cholesterol level.

- **Co – Enzyme Q 10: 200 – 300 mg a day. It is a powerful antioxidant that can help lower cholesterol level.**

- **Beta – Sitosterol: 1000 – 5000 mg a day. It is a plant sterol that inhibits the absorption of cholesterol from the intestine.**

- **Chromium picolinate: 500 – 1000 mcg. It improves glucose tolerance, helps lower LDL, and increases HDL.**

- **Red Yeast Rice: 1200 – 2400 mg a day. It contains fiber, plant sterols, and different monacolins, and reduces both LDL and TG.**

- **Policosanol:** 10 -20 mg a day. It is a long chain alcohol extracted from sugar cane or beewax and helps reduce LDL and TG.

- **Glucomannan:** 4 – 10 grams a day. It is a water soluble fiber that helps control blood sugar and cholesterol. It may be used in weight management and constipation as well.

- **Pantethine:** 900 mg a day. It is an active form of vitamin B5 and reduces total cholesterol, LDL and TG and increases HDL level.

- **L – Carnitine:** 1000 – 3000 mg a day. It helps lower cholesterol and TG levels.

- **PGX: 3000 – 4500 mg a day. It is a water-soluble fiber that helps lower blood sugar and cholesterol levels.**

- **Fenugreek: 10 – 40 grams a day, or as tincture 3 – 4 ml up to three times a day. This herb helps lower blood sugar, LDL and TG levels. The active ingredients responsible for it benefits are trigonelline, lysine, L-tryptophan, and saponins.**

- **Psyllium:** **5 – 20 grams a day. It is a bulk-forming laxative that contains insoluble fiber and mucilage. It is generally used for constipation, and it may reduce cholesterol and blood sugar levels as well.**

- **Garlic:** **600 – 900 mg a day. The active ingredients in garlic are allicin, ajoene, alliin, flavonoids and phenolic compounds. It reduces both LDL and TG and increases HDL.**

- **Guggul extract (containing 5% guggulsterones): 750 mg a day. It lowers LDL and TG, and increases HDL.**

- **Chitosan: 2000 – 4000 mg a day. It is a polysaccharide extracted from shrimp, crab and lobster. Being considered as a soluble fiber, chitosan may slow down the absorption of fats in foods. As a fat blocker, it may be used in weight management as well.**

- **Digestive enzymes: A full spectrum product.**
- **Probiotics: a product that provides 15 to 20 billion organisms per serving.**
- **Vitamin B – Complex: A high potency product.**

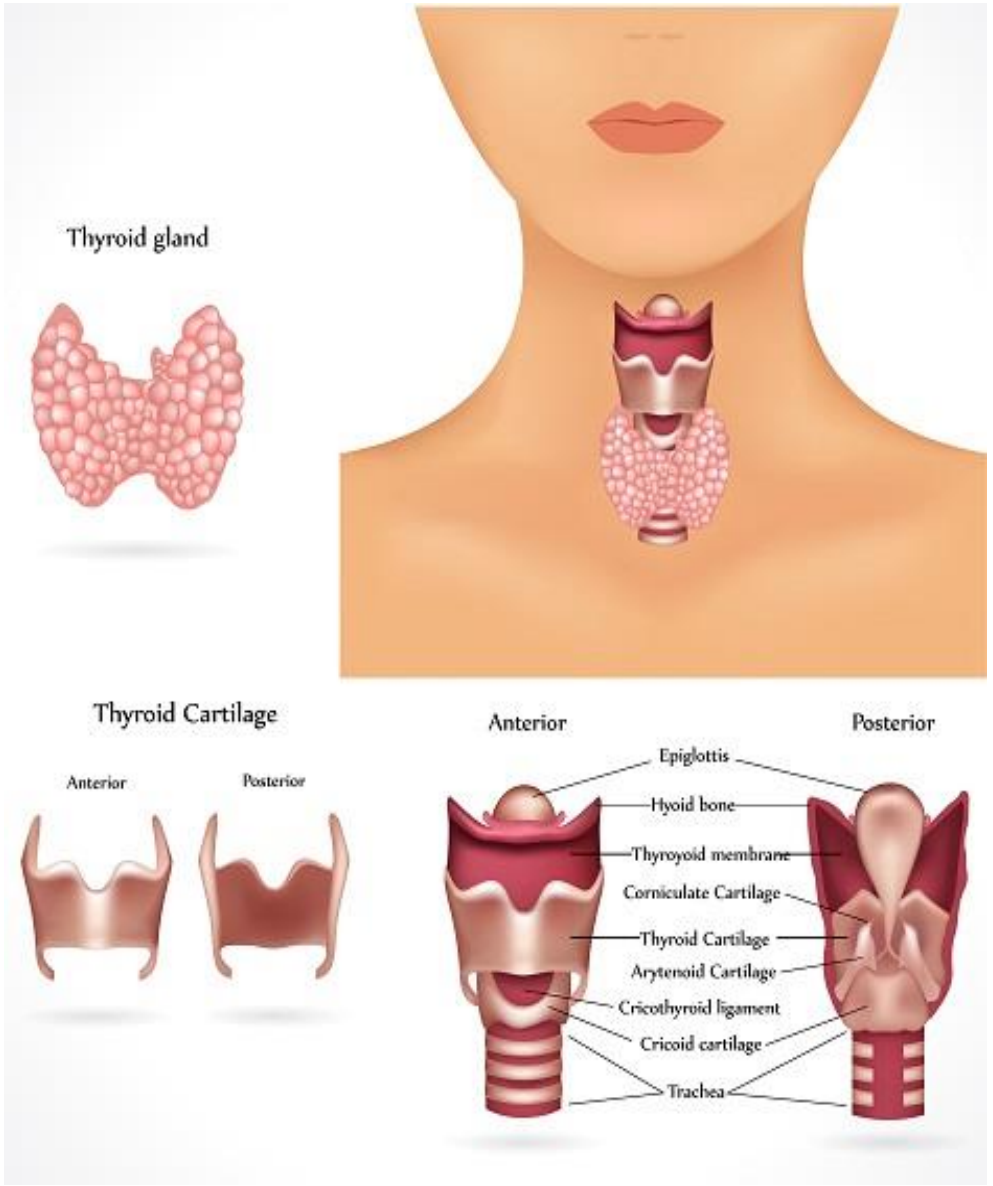
Miscellaneous Suggestions:

- **Exercise.**
- **Liver detoxification.**
- **Colon cleansing.**

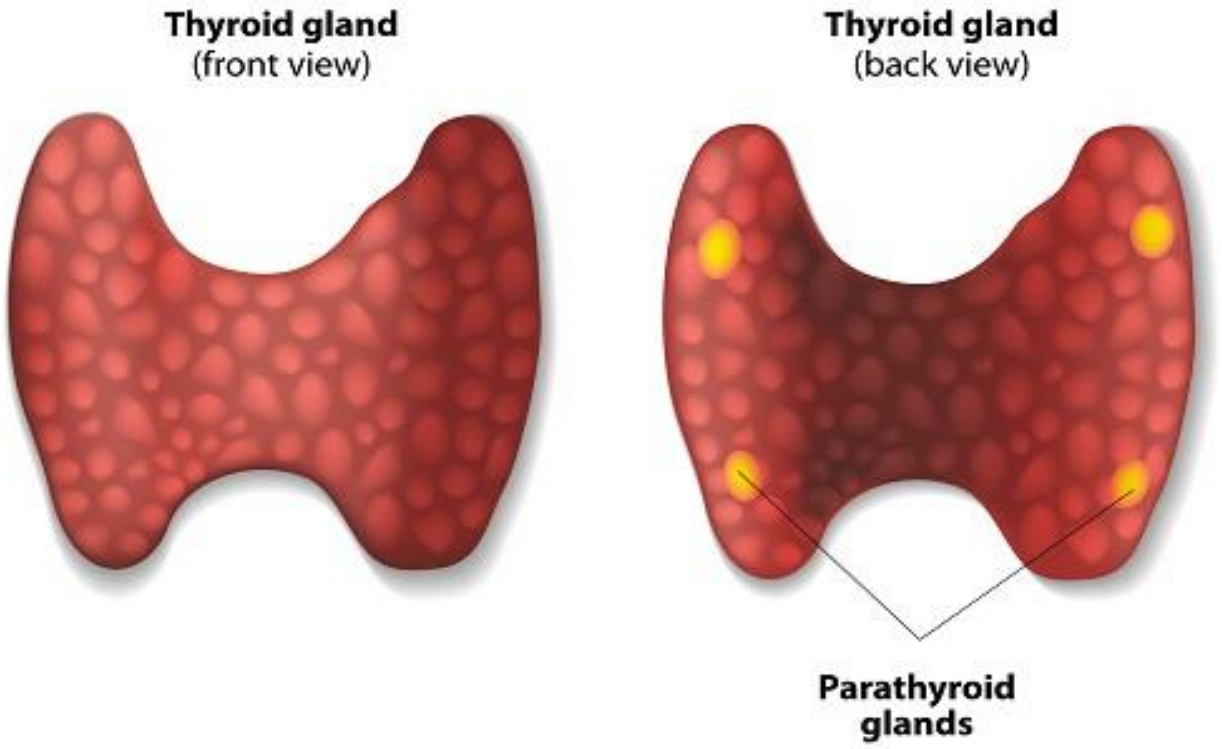
Hypothyroidism (Underactive Thyroid):

- **Hypothyroidism is a medical condition in which the thyroid gland is underactive, leading to a reduced production and low blood levels of thyroid hormones.**

- **The thyroid gland picks up iodine from the blood and produces two related hormones, thyroxine (T4) and triiodothyronine (T3).**

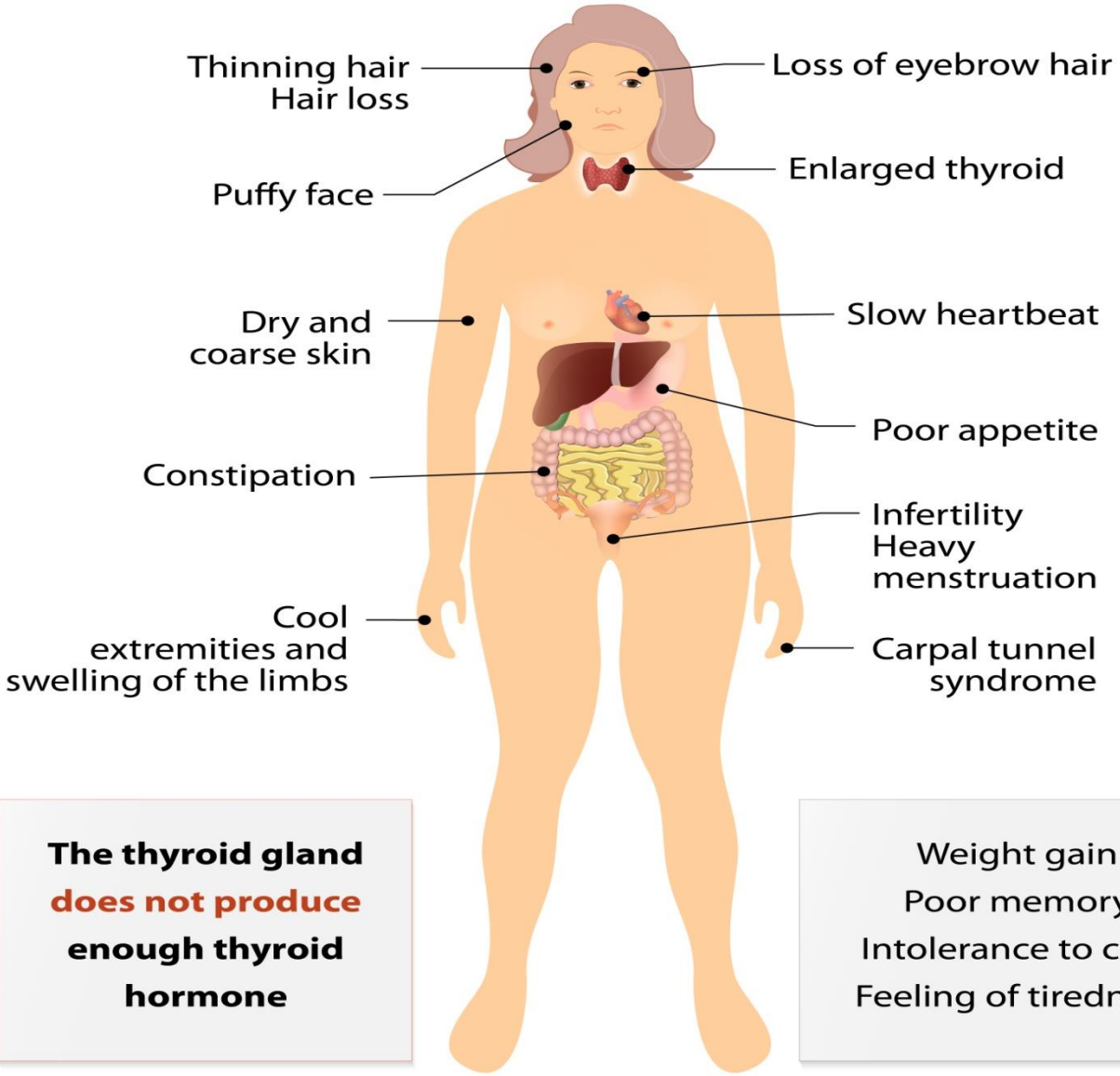


- **Function of the thyroid gland is controlled by TSH (thyroid-stimulating hormone). It is a hormone released from the pituitary gland.**



- **Signs and symptoms of low function thyroid are fatigue, tiredness, dry skin, hair loss, constipation, weight gain, hoarse voice, poor memory, menstrual abnormalities, muscle weakness, puffy face, hands and feet, cold intolerance, increased cholesterol level, anemia, cold extremities, and carpal tunnel syndrome.**

Symptoms of HYPOTHYROIDISM



The thyroid gland does not produce enough thyroid hormone

Weight gain
Poor memory
Intolerance to cold
Feeling of tiredness

Potential causes of hypothyroidism:

- **Autoimmune hypothyroidism: Hashimoto`s disease, and atrophic hypothyroidism.**
- **Surgical removal of the thyroid gland.**
- **Medications: excessive intake of iodine, lithium, anti-thyroid drugs, para-aminosalicylic acid, alpha-interferon, and aminoglutethimide.**
- **Radiation therapy of the neck.**
- **After pregnancy.**

- **Inflammation of the thyroid.**
- **Tumors of the pituitary and hypothalamus glands.**
- **Medical conditions: Sheehan`s syndrome, amyloidosis, sarcoidosis, and scleroderma.**
- **Hormonal imbalances among estrogen, progesterone, DHEA, and cortisol.**
- **Nutritional deficiencies: iodine, tyrosine, selenium, zinc, and copper.**

Restricted Foods:

- **1) Goitrogens:**

- Vegetables from brassica family (kale, broccoli, cauliflower, turnips, cabbage, Brussels sprouts, radishes, collard greens, kohlrabi, Bok Choy, rapini, mustard greens, rutabaga, horseradish, arugula, maca, wasabi, and watercress). These vegetables contain a phytonutrient called Isothiocyanate, which interferes with the uptake of iodine. Isothiocyanate is inactivated by cooking the vegetables.

- Soybeans.
- Peanuts.
- Pine nuts.
- Millets.
- Cassava root.

The most common cause of hypothyroidism worldwide is iodine deficiency.
Image: Copyright©Depositphotos.com /Lydie Salaun

- Soy.
- Saturated and Trans fats.

- **Regular tap water, as it contains fluoride and chloride. They may block the absorption of iodine.**
- **Spinach.**
- **Peaches, pears, and strawberries. They may increase the chance of developing goiter.**
- **Sugars and sweets.**
- **Alcohol.**
- **Food additives, preservatives, and colourings.**

Recommended Foods:

- **Plenty of filtered water: at least 2 liters a day.**
- **Whole grains.**
- **Foods high in fiber.**
- **Foods high in Omega-3: flaxseeds, walnuts, chia, and hemp seeds.**
- **Sea vegetables: kelp, nori (laver), dulse, kombu, hijiki, spirulina, and wakame (alaria). They are rich in iodine.**
- **Fish.**

- **Nuts, except peanuts and pine nuts.**
- **Sea salt.**
- **<u>Foods high in selenium:</u> Brazil nuts, sea foods, tuna fish, sunflower seeds, beef, lamb, onions, wheat germ, brown rice, oats, barley, mushrooms (shiitake, and crimini).**
- **<u>Foods high in zinc:</u> beans, lentils, and sunflower seeds.**

Recommended Supplements:

- **Iodine:** 150 – 300 mcg a day.

- **Selenium:** 100 – 200 mcg. It is an important mineral for the production of thyroid hormone.

- **Bladderwrack:** as capsules 200 – 600 mg a day, or as tincture 2 – 3 ml a day. It is a type of seaweed with active ingredients iodine, alginic acid and fucoidan.

- **L – Tyrosine: 1000 – 1500 mg a day. This amino acid is important for the production of thyroid hormones.**

- **Zinc: 50 – 100 mg a day.**

- **Copper: 2 – 3 mg a day.**

- **French Maritime Pine Bark Extract: 100 – 200 mg a day.**

- **Grape seed extract: 50 – 100 mg a day.**

- **Omega – 3 fatty acids:** 1- 3 grams a day.

- **DHEA (dehydroepiandrosterone):** 25 – 50 mg a day. It may improve thyroid function.

- **Ashwagandha:** 500 – 1000 mg a day. This herb reduces stress hormone level and improves thyroid hormones levels.

- **Multivitamins – Multiminerals:** A high potency product.

Miscellaneous Suggestions:

- **Exercise.**
- **Liver detoxification.**
- **Colon cleansing.**

Homework:

- **1) Describe the foods that are restricted in low function thyroid.**

- **2) Describe your supplementation in people with high levels of LDL cholesterol.**