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Hyperthyroidism: A Review

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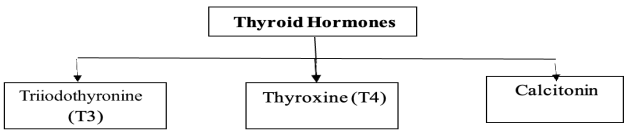
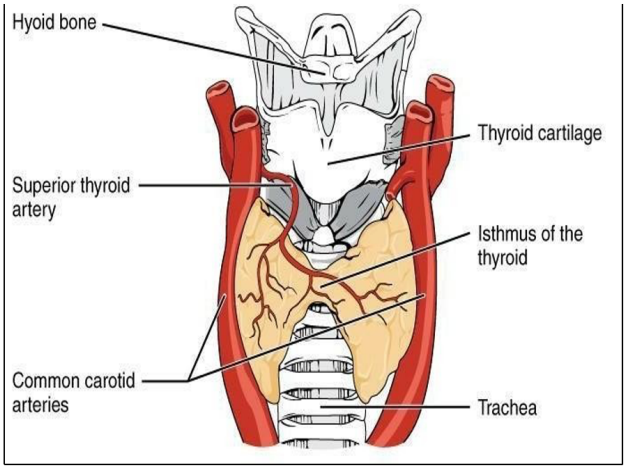
Abstract

Hyperthyroidism is characterized by excessive secretion of thyroid hormones, leading to elevated serum levels. It affects various organ systems,
including cardiovascular, nervous, gastrointestinal, and hepatic systems. Graves' disease, an autoimmune condition, is the most common cause, resulting in unopposed stimulation of the thyroid gland by antibodies against the thyroid-stimulating hormone receptor. Surgical removal of the thyroid gland is an option for patients with large glands, severe ophthalmopathy, and lack of remission. Medications like propylthiouracil and methimazole inhibit thyroid hormone secretion by blocking the peroxidase enzyme system and inhibiting coupling reactions. Glucocorticoids are used in thyrotoxicosis with thyroid tissue destruction, such as in subacute thyroiditis or type-2 amiodarone-induced thyrotoxicosis

Introduction

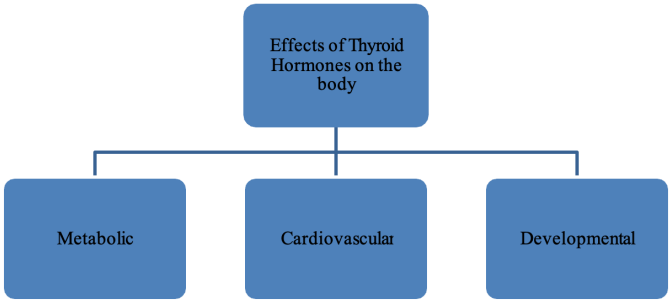
Thyroid Gland ● Comprising two lobes joined by an isthmus, the thyroid gland, also known as the thyroid, is an endocrine gland located in the neck. It is located underneath the Adam's Apple at the front of the neck. ● Thyroid hormones are secreted by the thyroid gland and mainly affect protein synthesis and metabolism.





Thyroid Hormones

The primary function of the thyroid is the production of the iodine- containing thyroid hormones, triiodothyronine (T3) and thyroxine (T4) and the peptide hormone calcitonin. T3 is so named because it contains three atoms of iodine per molecule and T4 contains four atoms of iodine per molecule. Thethyroid hormones have a wide range of effects on the human body.



METABOLIC:

Thyroid hormones impact nearly every bodily tissue and raise thebasal metabolic rate.
Thyroid hormones affect intestinal motility, appetite, and theabsorption of chemicals.
They accelerate the breakdown, cellular uptake, intestinal absorption,and synthesis of glucose.
They increase the amount of free fatty acids and promote the breakdown oflipids.

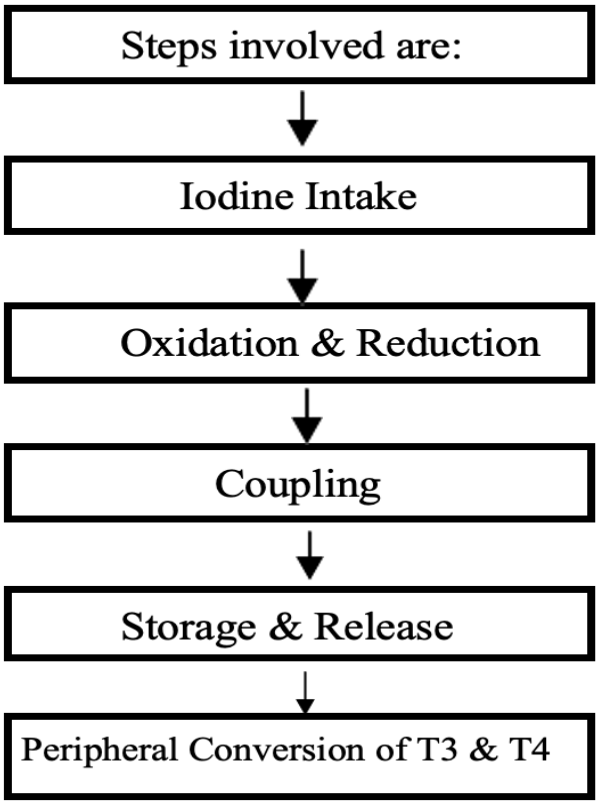
CARDIO VASCULAR :

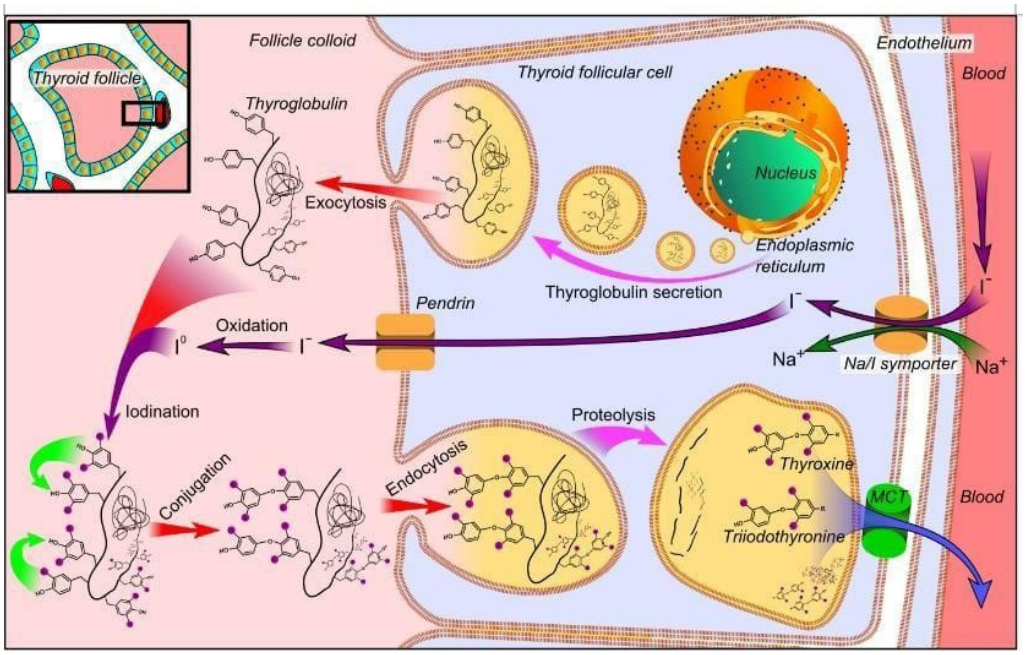
Tachycardia or bradycardia are two conditions where thehormones cause an increase in heart rate and intensity.
They speed up breathing, enhance oxygen intake andconsumption, and boost mitochondrial activity.

DEVELOPMENTAL:

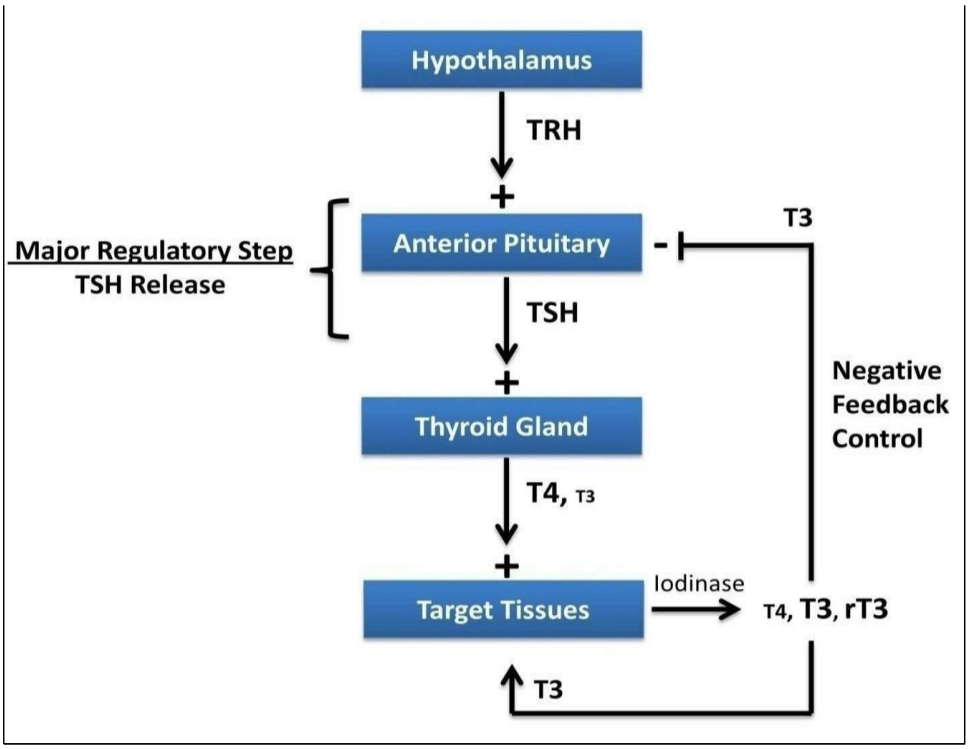
They accelerate adolescent growth, because the thyroid hormonesT3 and T4 primarily target growing brain cells.
Throughout the first several years of postnatal life and throughout prenatal development, thyroid hormones are especially importantfor brain growth.

SYNTHESIS OF THYROID HORMONES

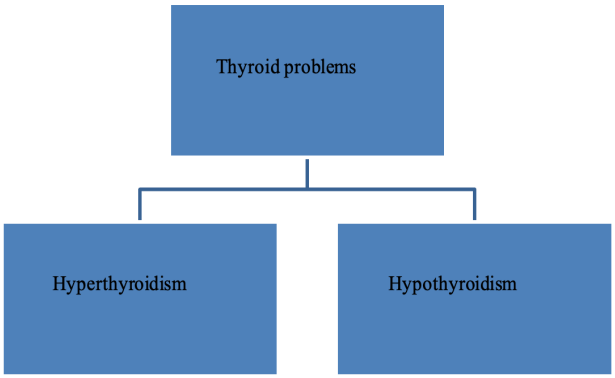




Regulation of Thyroid Hormones



Thyroid Complications



Hypothyroidism: Often referred to as low thyroid or underactive thyroid, this endocrine system condition occurs when the thyroid gland fails to generate enough thyroid hormone. Many symptoms, including poor tolerance to cold, fatigue, constipation, depression, and weight gain, might result from it.

Hyperthyroidism: It's commonly known that when your thyroid gland becomes overactive, it generates an excessive amount of the hormone thyroxine. Hyperthyroidism can cause an irregular or fast heartbeat and accidental weight loss by speeding up your body's metabolism.

HYPERTHYROIDISM

A disorder known as hyperthyroidism (overactive thyroid) occurs when your thyroid gland generates too much of a few key hormones, most notably "thyroxine."

Early on, hyperthyroidism may not show any symptoms at all. Untreated hyperthyroidism over time can lead to a variety of health issues, including obesity, joint discomfort, infertility, and heart disease.Frequent high blood pressure and a noticeable swelling of the thyroid gland may be the ensuing conditions.

The degree of hormone excess determines the signs and symptoms of hyperthyroidism. You can have increasingly noticeable symptoms and indicators as your metabolism keeps synthesizing more and more. Hyperthyroidism signsand symptoms usually include:

Feel nervous,weak or tired inability to concentrate

Weight loss or increased difficulty maintaining weight

Have hand tremors,or trouble in breathing

Dry, rough red skin

Hair loss

Cold intolerance (you can't tolerate cold temperatures like those around you)

Mood swing

Frequent or sometimes loose bowel

Increased appetite

Irritability

Difficulty in sleeping

Abnormal menstrual cycles

Breast Development in men.

Hyperthyroidism in infants or in neonates:

Although middle-aged and older women are the ones affected by this disease the most frequently, anybody can have it, including young children. The problems that each newborn baby experiences when they have "Graves Disease," an autoimmune disorder caused by antibodies attacking the thyroid gland and causing it to produce much more hormone than it should, can vary, but they can include low birth weight, small or malformed heads, bulging eyes, an enlarged liver, poor digestive systems, and loose bowel syndrome.

Issues with resting

Even minor episodes of hyperthyroidism in babies can result in significant physical and intellectual impairments if left untreated.

Hyperthyroidism in children and teens

In general, children and teens who develop hyperthyroidism have the samesigns and symptoms as adults do, but they may also experience:

Poor growth, resulting in short stature

Delayed development of permanent teeth

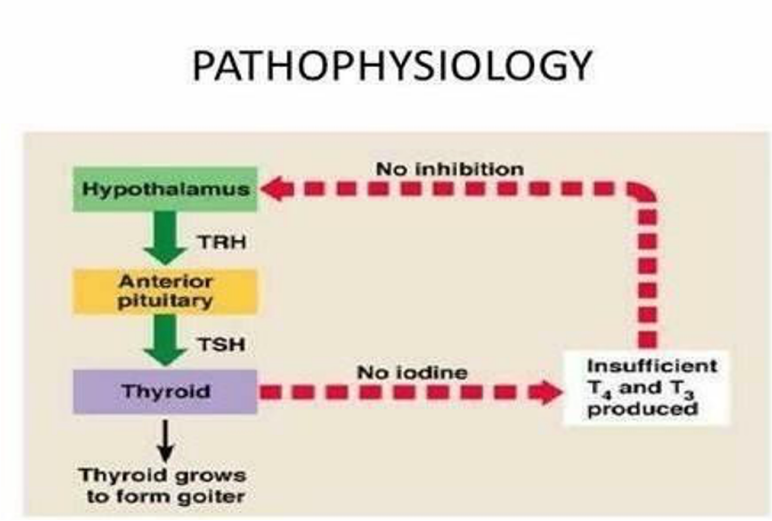
Delayed puberty

Poor mental development

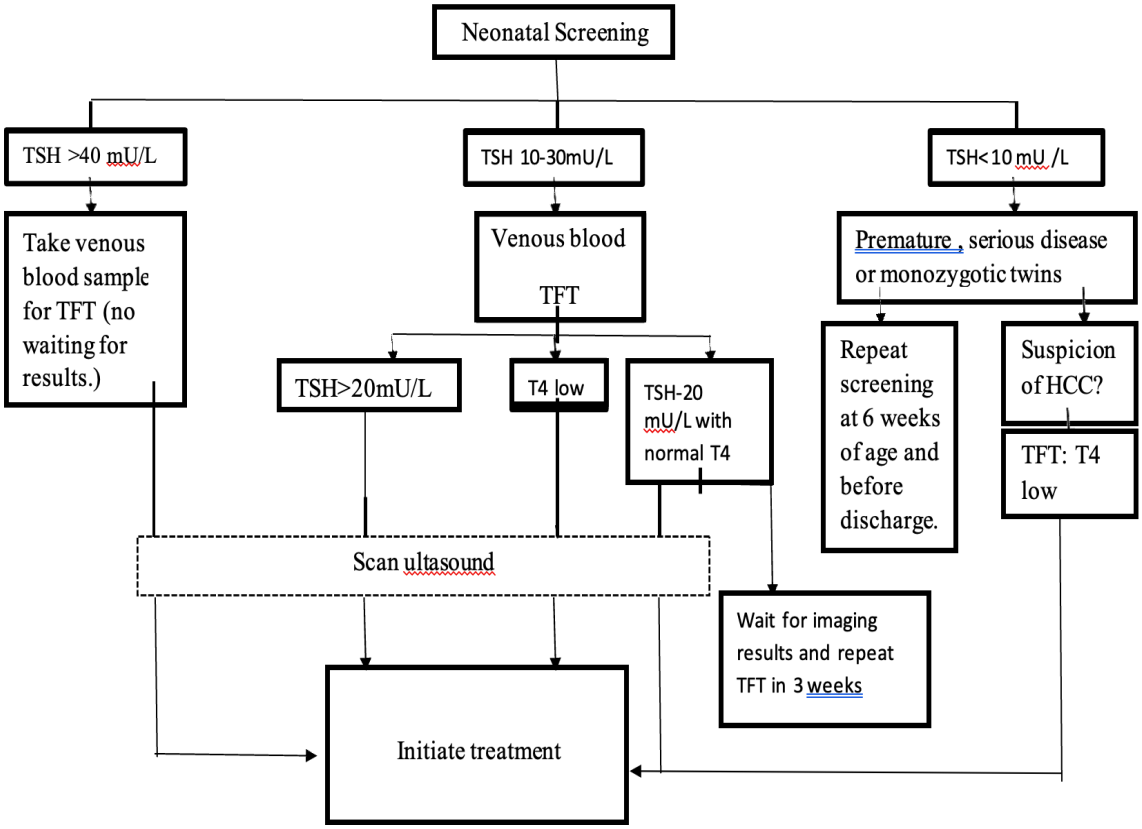
Hyperthyroidism in women

According to Garber et al. (2012), women are more likely to acquire hypothyroidism as they age, throughout pregnancy, the postpartum phase, and menopause. Globally, the most frequent cause of hyperthyroidism is excess iodine (Vanderpump, 2011). Hashimoto's thyroiditis, the most prevalent cause of hyperthyroidism in the US, is a result of the thyroid gland being harmed by long- term inflammation that is started and maintained by the immune system.

The risk of hyperthyroidism in women rises with age, as well as during menopause, pregnancy, and the postpartum phase.



TSH > 10 mU/L	+	Primary hyperthyroidism due to autoimmune thyroid disease
Low	+	Primary "subclinical" hyperthyroidism (early autoimmune)
Low-normal	-	Recovery from systemic illness External irradiation, drug-induced,
Low or low- normal		congenital hypothyroidism Iodine excessiveness Seronegative autoimmune thyroid disease Rare thyroid disorders such as amyloid, sarcoid
Normal Elevated	+ or -	Recovery from subacute granulomatous thyroiditis
	-	TSH or T4 artifacts Thyroid hormone resistance Blockade of T4 to T3 conversion (amiodarone) or congenital 5' deiodinase deficiency Assay artifacts (human mouse antibodies)
TSH 5-10 mU/L **Low,Low-normal**	+ or -	Early primary autoimmune hyperthyroidism
Low, Low-normal	-	Milder forms of non autoimmune hyperthyroidism Central hyperthyroidism (usually TSH 1.0 mU/L or less)
Elevated	- or +	Thyroid hormone resistance T4 to T3 conversion blockade (amiodarone)
TSH 0.5-5 mU/L **Low, Low-normal**	- or +	T3 or desiccated thyroid replacement Use of levothyroxine irregularly



Prevention:

In order to prevent an overactive thyroid, it is crucial to restrict your consumption of iodine, particularly iodized salt. Iodine is also included in certain dietary supplements, which need to be used under a dietitian's guidance. Although iodine shortage is seldom the cause of hyperthyroidism anymore, high iodine consumption is far more common in Germany.

Adults should consume 200 micrograms (µg) of iodine daily, but no more than 500 µg.

Little ones require less than 200 µg of iodine daily, whereas women who are pregnant or nursing require somewhat more.

In 2014, the Robert Koch Institute conducted research on iodine consumption in kids and teens under the age of 18. They discovered that 85% of people under the age of 18 had adequate or excessive iodine intake. There

TREATMENT:

If thyroxine levels are too high, Specific

Non-Pharmacologic Therapy

Surgical takeoff of the thyroid gland in patients if with large gland (>80 g), severe ophthalmopathy, and lack of remission is present. Thyroid surgery is rapid and effective but invasive and expensive. Patients need to be euthyroid before surgery.It is particularly reserved for pregnant women intolerant of thioamides, children with severe disease, severe ophthalmopathy, amiodarone-induced refractory disease, or unstable cardiac conditions. In the past, stress in the operating room during surgery was the consummate ubiquitous antecedent of thyroid storm, with a mortality of 50%. Thyroid storm during surgery is exceedingly rare now with preoperative therapies including propranolol, antithyroid medication, and iodine. If thyroidectomy is planned, propylthiouracil or methimazole is usually given until the patient is biochemically euthyroid (usually six to eight weeks), followed by the addition of iodides (500 mg/day) for 10 to 14 days before surgery to de-escalate the vascularity of the gland.

Levothyroxine perhaps added to sustain the euthyroid state while the thioamides are continued. Propranolol can be used for several weeks preoperatively and seven to ten days after surgery to maintain a pulse rate less than 90beats/min [3].

Antithyroid Pharmacotherapy

The mainstay of drug therapy is suppression of thyroid hormone synthesis with thioamides. The duration of antithyroid medications is considered to be twelve to eighteen months.

Drugs used are:

Predominantly, the antithyroid drugs must be prescribed to treat the hyperthyroidism that are as follow:

Thioamides:
Carbimazole,Methimazole,Propylthiouracil.
Iodide salts: iodides of Na & K, organic iodides.
Radioactive salts:I131
Anion inhibitor: Nitrates, Perchlorates.
Ipodate
Beta- blocker: Propranolol, atenolol.

BETA-BLOCKER

Beta blockers are a class of medications primarily used to manage conditions such as hypertension (high blood pressure), angina (chest pain), arrhythmias (irregular heartbeats), and heart failure. They work by blocking the effects of adrenaline on the body's beta receptors, thereby reducing heart rate and blood pressure, and lessening the workload on the heart.

These medications are also prescribed for certain anxiety disorders, such as performance anxiety or social phobia, due to their ability to reduce physical symptoms liketrembling, palpitations, and sweating associated with anxiety.

Beta blockers are available in various forms, including oral tablets and eye drops. They are typically prescribed by a healthcare professional based on individual health needs and medical history. It's important to follow the prescribed dosage and instructions carefully and to consult a doctor before starting or stopping any medication regimen. Common side effects may include fatigue, dizziness, cold hands and feet, and some sexual dysfunction.

It's also essential for individuals taking beta blockers to avoid abruptly discontinuing the medication, as this can lead to rebound hypertension or other adverse effects.

NEW ADVANCEMENT

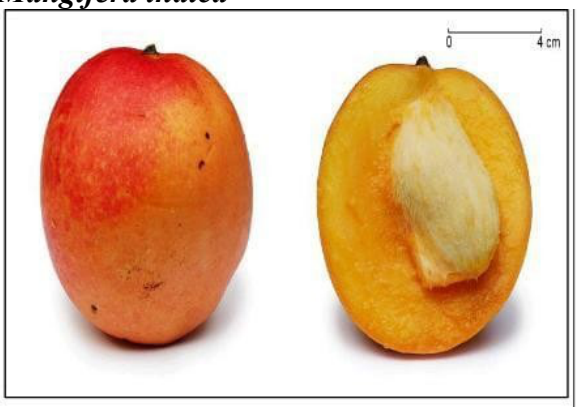
Radioactive iodine ablation (RAI) and surgery may be considered once hyperthyroidism is controlled. Evidence shows that RAI treatment cures hyperthyroidism for more than 90% of patients with Graves' disease or autonomous thyroid nodules.

HERBAL DRUG TREATMENT

Plants stimulating thyroid hormone secretion at glandular level only

S no.	Plant species	Treatment	Results
1.	***Bacopa monnieri*** 	Leaf extract 200 mg/kg for 15 days.	Raised both serum T3 and T4 circulating concentrations and reduced oxidative stress.
2.	***Withania somnifera*** 	Root extract 1.4 kg for 15 days	Raised both serum T3 and T4 circulating concentrations and reduced oxidative stress
Plants stimulating thyroid morphology			

3.	***Commiphora mukul*** 	Petroleum ether extract20 mg/100gm for for 8 days	Increased free Thyroxine index , hypertrophy and hyperplasia of follicular cells, appearance of vacculization in colloid material.
4.	***Saussurea lappa*** 	Root extract 400mg/kg for 14 days	Appearance of more vacuoles and hypertrophy of epithelial cells in 7 days
5.	***Eichhernia crassipes*** 	Water soluble fraction of ash 2g/kg for 20days	Stimulated thyroid function
6.	***Innula racemosa*** 	Root extract 400mg/kg for 20 days	Stimulate thyroid histology
Plants stimulating thyroid hormone secretion at both glandular and peripheral organs			

7.	***Mangifera indica*** 	Fruit peel extract mg/kg for 10 days	Serum T3 and T4 increased and reached oxidative stress
8.	***Bauhinia vareigata*** 	Alcoholic extract 2g/kg for 20 days	Increased thyroidal weight ,I^{131} uptake active thyroidal histology and reduced cholesterol levels
9.	***Bauhinia purpurea*** 	Bark extract 2.5 mg/kg for 15 days	Increase T3 and T4 and reduce lipids
10.	***Cucumis melo*** 	mg/kg for 10 days	Increased serum T3 and T4

Conclusion

An endocrine condition that disproportionately affects women is hyperthyroidism. Certain diseases have modest signs and symptoms that are typically mistaken for other illnesses like depression or aging. Within professional associations, there is disagreement about screening recommendations. Delegates from the American Thyroid Association, American Association of Clinical Endocrinologists, and Endocrine Society reached an agreement, citing a paucity of data in favor of population-based screening. They advised screening for women who are more likely to have hyperthyroidism, such as those who are pregnant, over 60, or have a family history of thyroid issues. Nurses are in a unique position to recognize women who may be at risk and to provide them with comprehensive information about thyroid disease, including its many forms and current treatments. To prevent the negative effects of illnesses and disorders resulting from autoimmune responses, an individual has to take good care of their body and health. Live well, stay safe.

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