

## Mid-Term Assignment

Course Title: Human Physiology Instructor: Dr Sara Naeem Total Marks: 30

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1.Explain homeostatic mechanism regarding the control of calcium in the body with reference to parathyroid hormone and calcitonin.

Answer:

### Calcium Homeostasis:

Calcium homeostasis mechanism is that mechanism by which the body maintains the adequate calcium level. Parathyroid hormone and calcitonin are hormones that control the calcium homeostasis.

Blood calcium is regulated by:

Organs system:

- a. Intestine.
- b. Bone.
- c. Kidney

Hormones:

- a. Parathyroid hormone.
- b. Calcitonin.

### Parathyroid gland:

They are four in number and are located behind every upper and lower poles of thyroid gland. These glands secrete parathyroid hormones.

Action of parathyroid hormone:

Mechanism:

Increase in extracellular calcium concentration.  $Ca^{2+}$  then binds to the receptors and activates phospholipase C which then inhibits PTH secretion. When the extracellular  $Ca^{2+}$  decrease so there is decrease in  $Ca^{2+}$  binding to the receptors which stimulates PTH secretion.

#### 1. Action on blood $Ca^{++}$ :

Parathyroid hormone increases blood  $Ca^{++}$  concentration due to increase in absorption of calcium from blood and the decrease in excretion of calcium from blood by kidneys.

#### 2. Action on bone:

Parathyroid hormone increases the absorption of  $Ca^{++}$  from bone in two steps;

##### a. Rapid absorption of $Ca^{++}$ :

In rapid absorption parathyroid hormone activates calcium pumps which then pumps  $Ca^{++}$  from bone fluid into ECF.

##### b. Slow absorption of $Ca^{++}$ :

In slow absorption parathyroid hormone activates the osteoclast present in bone and cause the formation of new osteoclast and thus  $Ca^{++}$  is absorbed from bone.

3. Action on kidneys:

Parathyroid hormone increases the absorption of  $Ca^{++}$  in the distal tubules and collecting duct of the kidneys.

4. Action on GIT:

Parathyroid hormone converts hydroxycholecalciferol into dihydroxycholecalciferol which then increases the absorption of  $Ca^{++}$  from the intestine.

Calcitonin:

Secreted by:

Calcitonin is secreted by C cells of thyroid gland.

Action of calcitonin:

Mechanism:

Cyclic AMP mechanism.

1. Action on blood  $Ca^{++}$ :

Calcitonin decreases the concentration of blood  $Ca^{++}$ .

2. Action on bone:

Calcitonin decreases the calcium pump activity and increases the osteoblastic activity. It also decreases the osteoclast formation and bone remodeling.

3. Action on GIT:

Calcitonin decreases the calcium absorption from intestine and the  $Ca^{++}$  then loses in feces.

4. Action on kidney:

Calcitonin decreases the absorption of calcium from distal tubule and collecting duct of kidney and then  $Ca^{++}$  is lost in urine.

Regulation of  $Ca^{++}$  concentration:

When plasma concentration increases it increases the secretion of calcitonin.

When plasma concentration decreases so it decreases the secretion of calcitonin.

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2. Give clinical differentiation between hypothyroidism and hyperthyroidism.

Hyperthyroidism:	Hypothyroidism:
A disease where there is excessive production of thyroid hormone.	A disease where there is low production of thyroid hormone.
Causes:  Too much iodine.	Causes:  Not have too much iodine.  it is hashimoto's disease which is autoimmune disease as well in this the body attacks on

It is a graves disease which is an autoimmune disease in which body produces TSI.

Toxic nodular goiter , nodular growth produces excessive thyroid hormones.

Due to thyroid replacement medication.

Signs and symptoms:

Weight loss because of burning calories.

Heart rate becomes fast.

Person cannot tolerate heat.

Person become restless and irritable.

Diarrhea due to increase gut mobility.

Skin becomes oily.

Unable to focus mentally on anything.

Treatment:

Surgery:

By removing thyroid gland.

Medications:

Antithyroid medications like propyl thiouracil, iodine etc can be used.

Therapy:

Radioactive iodine therapy can also treat hyperthyroidism

thyroid gland.

Due to pituitary tumor (it stops anterior pituitary gland from releasing TSH.)

Due to antithyroid medications (PTU).

Signs and symptoms:

Weight gain because of gaining calories.

Heart rate becomes slow.

Person cannot tolerate cold.

Person become tired and fatigued.

Constipation occurs due to decrease in gut mobility.

Skin becomes dry.

Memory loss.

Treatment:

Surgery:

Thyroid hormone replacement.

Can be treated by avoiding sedatives.

## Clinical differences between Hyperthyroidism and Hypothyroidism:

3. Classify enzymes and their function in digestion.

Answer:

### Classification of Enzymes:

Our body produces different digestive enzymes and those enzymes play important role in digestion.

Following are the digestive enzymes of our body;

1. Amylase.

2. Lactase.

3. Lipase.
4. Maltase.
5. Protease.
6. Sucrase.

### Functions of enzymes in digestion:

Following are the functions of the above enzymes in digestion;

#### 1. Amylase:

Amylase is a digestive enzyme which helps in the digestion of carbohydrates by breaking starches into sugar.

Secretion:

Amylase is secreted by our salivary glands and pancreas.

#### 2. Lactase:

Lactase is a digestive enzyme which helps in the breakdown of lactose (found in dairy products) into smaller products glucose and galactose which can be easily absorbed by our intestine.

Secretion:

Lactose is secreted by those cells which lines the walls of small intestine.

#### 3. Lipase:

Lipase is a digestive enzyme which helps in the breakdown of fats into fatty acids and glycerol.

Secretion:

Lipase is secreted by our mouth and stomach in small amount and in large amount by our pancreas.

#### 4. Maltase:

Maltase is a digestive enzyme which helps in the breakdown of maltose to simple sugar.

Secretion:

Maltase is secreted by our small intestine.

#### 5. Protease:

Protease is a digestive enzyme that helps in the breakdown of proteins into amino acids.

Secretion:

Some proteases are secreted by small intestine and some are synthesized by pancreas.

#### 6. Sucrase:

Sucrase is a digestive enzyme which helps in the breakdown of sucrose into simple sugars of glucose and fructose.

Secretion:

Sucrose is secreted by our small intestine.

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