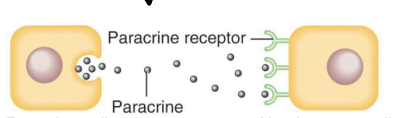
Signaling

Un-contact dependent

Paracrine

Signaling ligands:

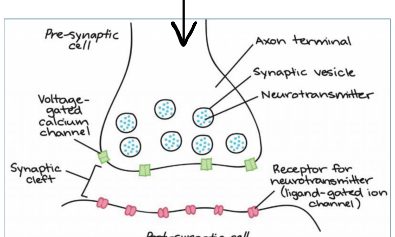
- Neurotransmitters
- Cytokines



Synaptic

Signaling ligands:

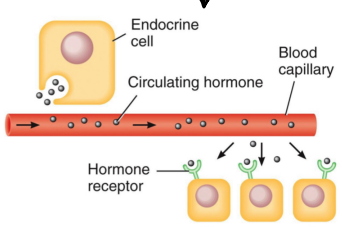
Neurotransmitters



Endocrine

Signaling ligands:

Hormones

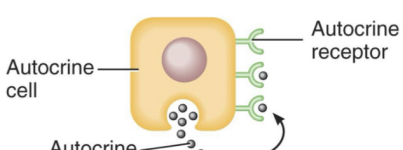


Autocrine

Signaling ligands:

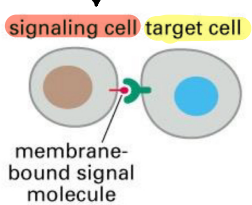
Proteins Growth factors

- NGF
- EGF
- PDGF



Contact dependent

Signaling cell has proteins on its plasma membrane then those proteins bind to receptors on the PM of the target cell just when both cells are in contact



Endocrine hormones(Not-local hormones)

Polar (water soluble or hydrophilic)

Peptide hormone

A polypeptide chain with less than 100 Amino acids

Glycoprotein hormone

A polypeptide chain with more than 100 Amino acids and at least one bounded carbohydtare moiety (-CHO)

Protein hormone

A polypeptide chain with more than 100 Amino acids

- They move via the bloodstream without carrierr protiens to their target cells
- Their receptors on the taregt cells(**on the plasma membrane**)

Non-polar(lipid soluble or lipophilic)

Steroid hormones

Derived from : **Cholestrol**

Cortisol, Testosterone, Estrogen, Progestrone

Thyroid hormones (Amine hormones)

Derived from : **Tyrosine**(An amino acid)

T3 (Triiodothyronine) **T4** (Thyroxine)

Although they are derived from the amino acid (Tyrosine) but they are lipophilic due to **presence of benzene ring in each of them**

The gas nitric oxide (NO)

- They move via the bloodstream by carrierr protiens to their target cells
- Their receptors into the taregt cells (**In the cytoplasm OR in the nuclues**)

A **hormone** is a chemical messenger that is produced by specific glands or tissues in the body and travels (usually through the blood) to target organs or cells to regulate physiology and behavior..

Hormones

Local hormones
(Their effects locally)

They are produced only when needed

Not-local hormones(Their effects not locally)

Endocrine hormones (They move through the bloodstream until they reach to their receptors in/on the target cells)

Eicosanoid: A lipophilic hormone that is derived from the arachidonic acid (**Fatty acid**) that is found on the cell membranes .

This hormone has to **major** types:

Leukotriene

Prostaglandin

Although this hormone is lipophilic hormone but it acts as the hydrophilic hormones in terms of binding to receptors on the target cells .Its receptors (like : **G-protein coupled receptors**)on the surface of the target cell and it acts as **Autocrine** and **Paracrine signals**

Signaling ligands

- They bind to cell-surface receptors
  - Growth factors
  - Hydrophilic hormones
  - Neurotransmitters
  - Lipophilic signaling molecules
    - Like: Prostaglandins
- They bind to intracellular receptors (in the cytoplasm OR in the nucleus)
  - Lipophilic hormones (They diffuse into the target cells to bind to their receptors)

Amine hormones

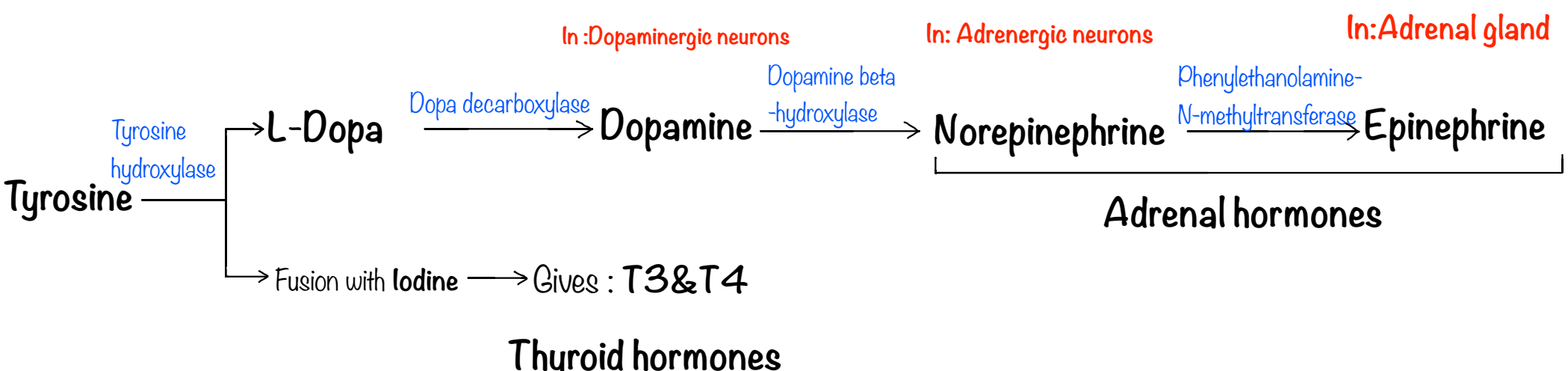
Derived from the amino acid : **Tyrosine**

- .T3(Triiodothyronine)
- .T4(Thyroxine)

Secreted by: **The Thyroid gland**

- .Epinephrine(Adrenaline hormone)
- .Norepinephrine

Secreted by : **The Adrenal gland**



The hormones once they are synethesized and secreted they aren't ready for the immediate use

Preprohormone

"Pre" indicates to a signal peptide segment that guides the prohormone to its proper location then it will be removed

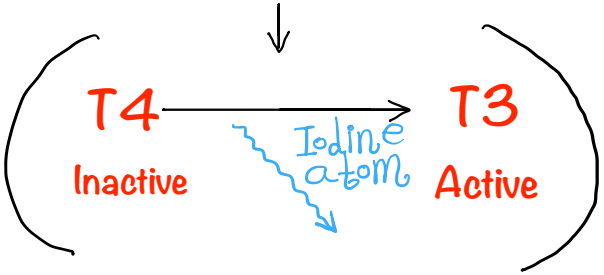
Prohormone

Like: **Proinsulin**(insulin+ C segment)

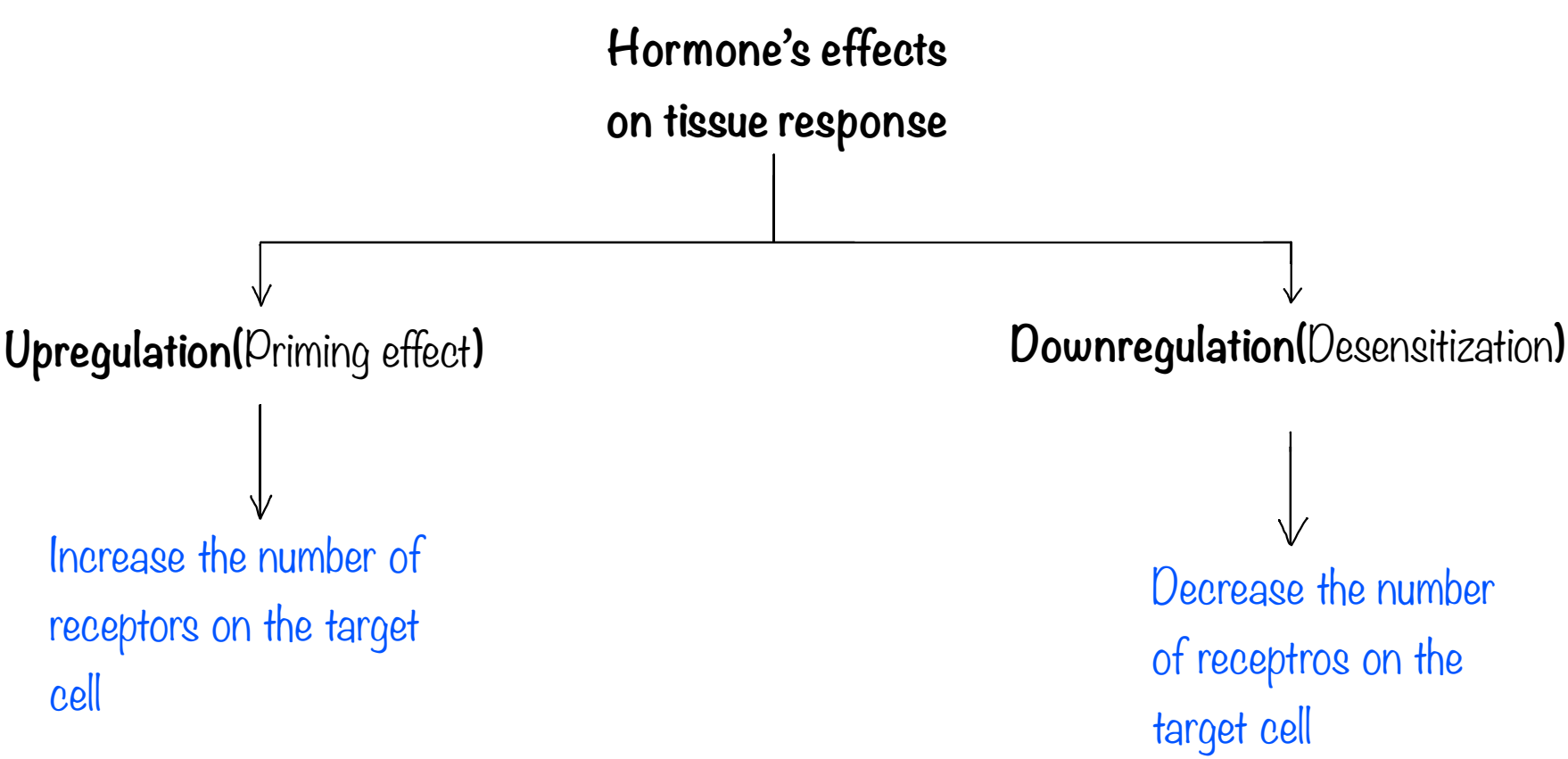
More biological processing :

Insulin

Prehormone



In peripheral tissues


Hormone's effects
on tissue response
Upregulation(Priming effect)
Increase the number of
receptors on the target
cell
Downregulation(Desensitization)
Decrease the number
of receptros on the
target cell

Receptors

Loaction

Membrane receptors

For :**Hydrophilic hormones & Eicosanoids**

Intracellular receptors

(In the cytosol and the nucleus)

For:**Lipophilic hormones**

Types

Enzymes-Linked receptors

Located on the cell membrane and they can float into the cell in the cytoplasm

Ligand binding location may occur at the cell membrane then this will trigger intracellualr enzymes OR the ligand binds to the enzymes into the cell if it succeeded to diffuse into the cell

G-protien coupled receptors (**G-PCRs**)

Located on the cell membrane

Ligands bind to G-PCRs on the cell membrane then this will trigger intracellular signaling

Ion channels -Linked receptors

Located on the cell membrane

Ligands bind to the ion channels on the cell membrane then this causes the opening or closing of them

Responsiveness of the target cell to hormones

Hormone's concentration

The rate of the response can be increased with increasing the hormone's concentration but at a specific point any additional increase will be deficient and inactive ,but actually do we need this increase in the concentartion ? No we don't due to the **signal amplification** (not condition that all receptors must be occupied by hormones to manage great cellular response)

Abundance of the receptors in/on the target cell

More receptors (**specific ones (characterized for the ligands which needed))** the greater cellular response will be

Presence of other hormones

Synergistic hormones

Enhances the effect of the hormone

Antagonisitc hormones

Reduces the effect of the hormone

Inhibits the effect of the hormone