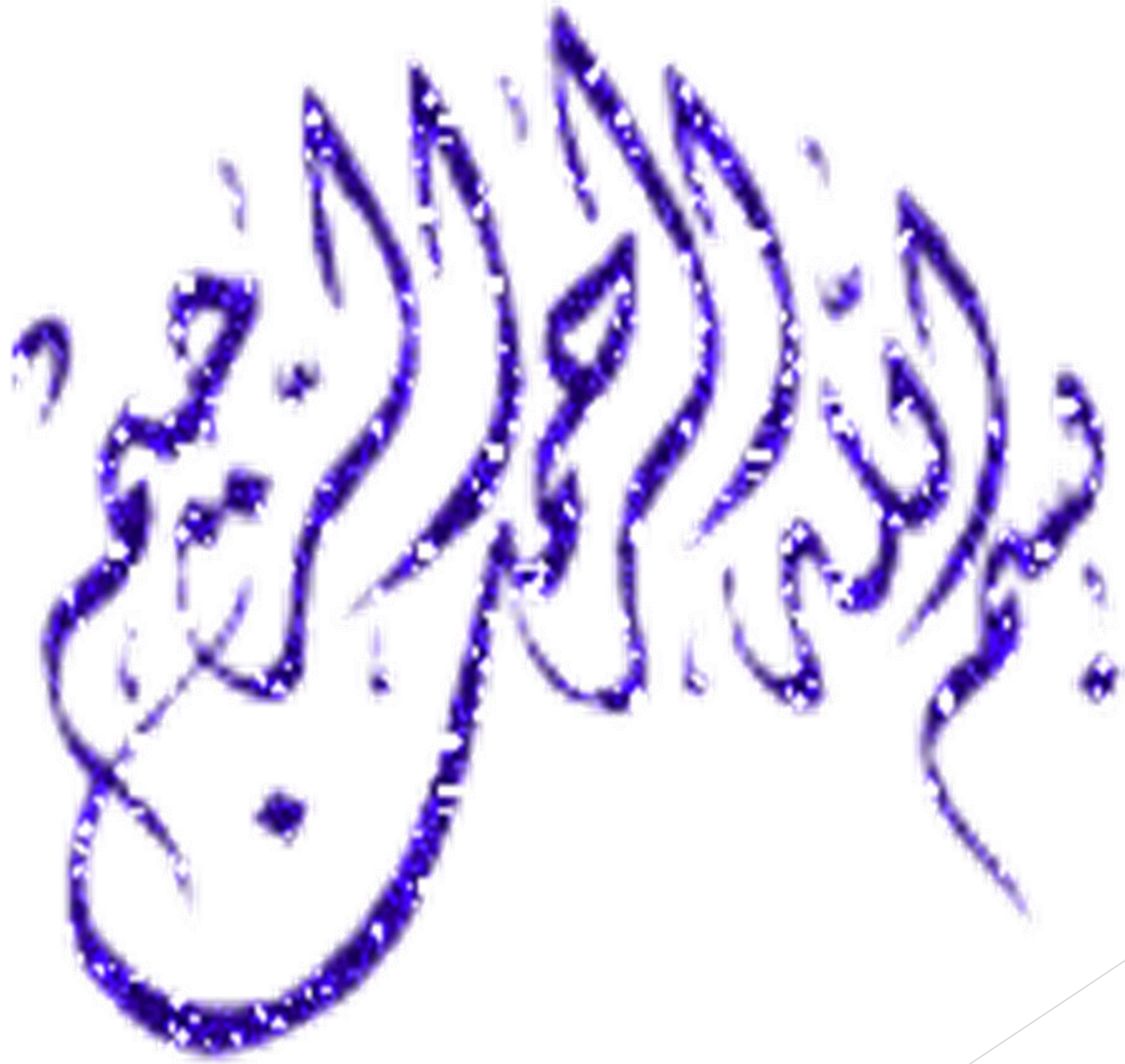


Medical Conditions Associated with Dementia

DR Mahdi Shafiee/ Neurologist/ faculty member of Tehran University of Medical Sciences

Neurodegenerative disorders Linked to Dementia

- Alzheimer's Disease
- Dementia with Lewy Bodies
- Vascular Dementia
- Frontotemporal Dementia (Pick's Disease)
- Mixed Dementia
- Parkinson's Disease Dementia
- Wernicke-Korsakoff Syndrome
- Creutzfeldt-Jakob Disease
- Huntington's Disease (Huntington's Chorea)
- HIV/AIDS Dementia
- Fatal Familial Insomnia
- Chronic Traumatic Encephalopathy/Brain Injury

What's disease?

- Disease is, any harmful deviation from the normal structural or functional state of an organism.

- Homeostasis is the ability of living systems to maintain a steady and uniform internal environment to allow the normal functioning of the entire body or each systems of the body.
- Homeostatic regulation is mediated by nervous and hormonal systems, which are regulatory systems.

- Homeostasis is mainly involved in managing various internal variables of the living system like body temperature, pH of various fluids, the concentration of different ions, and the body sugar level.

- A number of regulatory mechanisms are employed to resist changes in the body against environmental and bodily factors.

Main functions of Nervous System (Homeostatic regulation)

A) Maintain of Consciousness (the two main components of consciousness; Awareness is defined by the content of consciousness, and arousal is defined by the level of consciousness.)

B) Cognitive functions (Information Processing for making a decision) :

“complex attention,

learning and memory,

language,

perceptual-motor control,

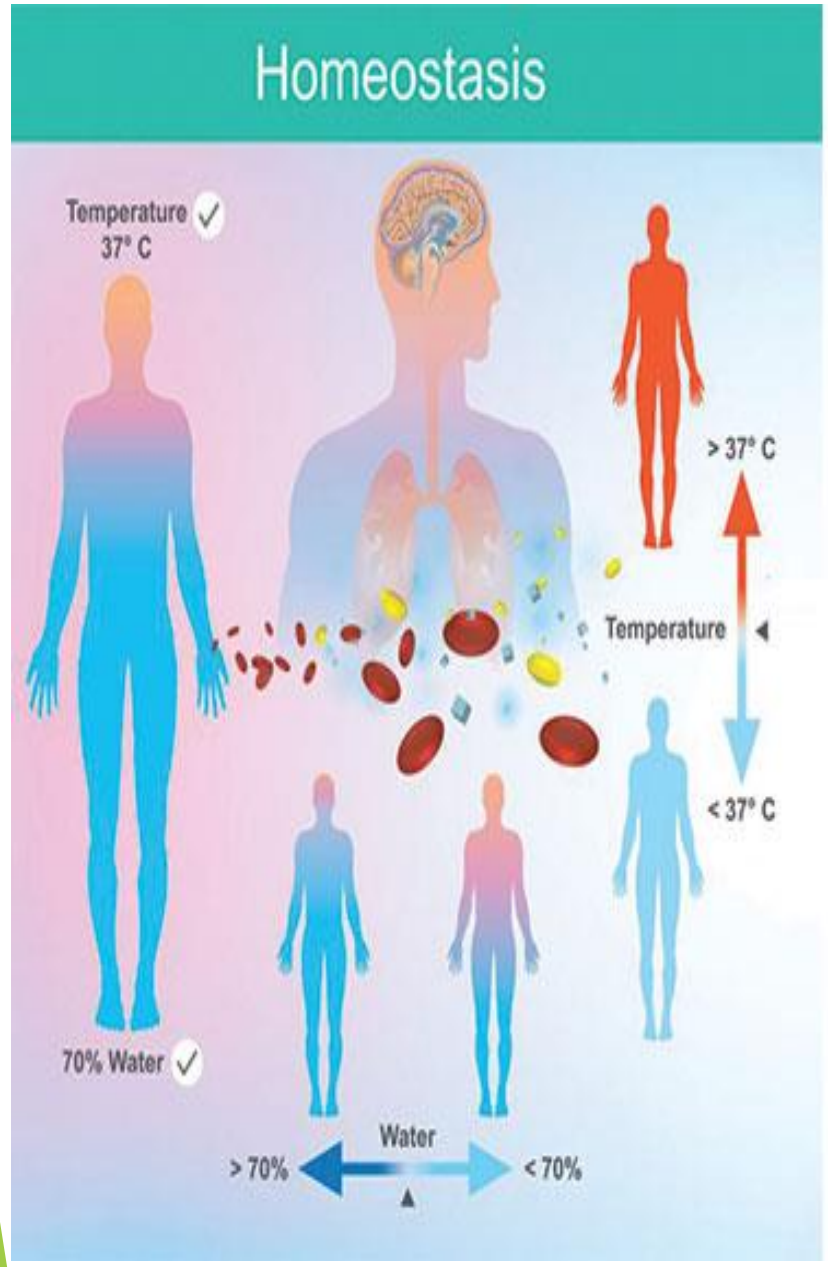
social cognition,

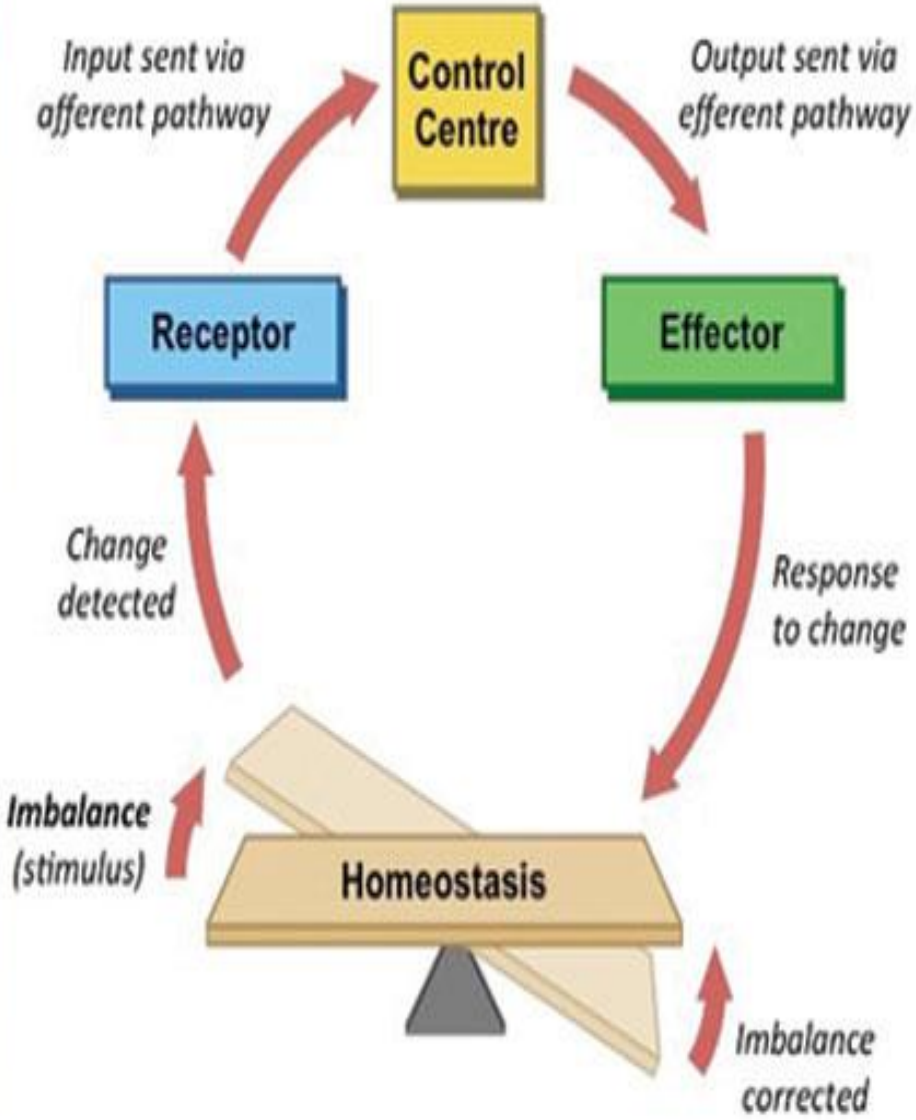
executive function”

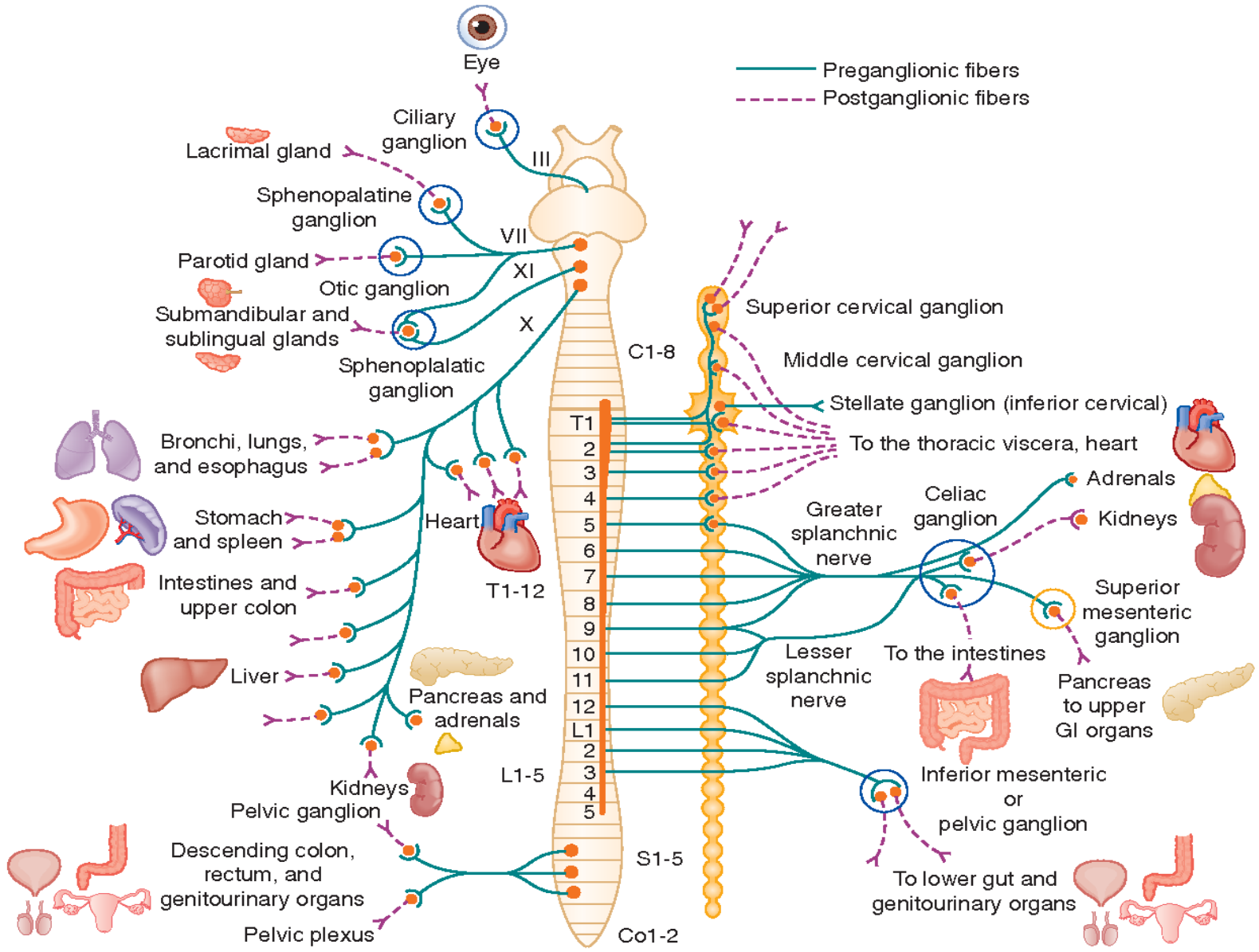
C) Motor function

D) Perception/feeling

E) As regulatory system (balancing the chemical or physical parameters)


Homeostasis
Temperature
37° C
> 37° C
Temperature
< 37° C
70% Water
Water
> 70%
< 70%


Input sent via afferent pathway
Control Centre
Output sent via efferent pathway
Receptor
Effector
Change detected
Response to change
Imbalance (stimulus)
Homeostasis
Imbalance corrected



Parasympathetic nervous system (PNS)
(craniosacral outflow)

Sympathetic nervous system (SNS)
(thoracolumbar outflow)

balancing the chemical or physical parameters

A number of homeostatic regulation processes, balancing the chemical or physical parameters, take place in the human body. Generally, there are three types of physical/chemical homeostatic regulation in the body, which are:

1. Thermoregulation

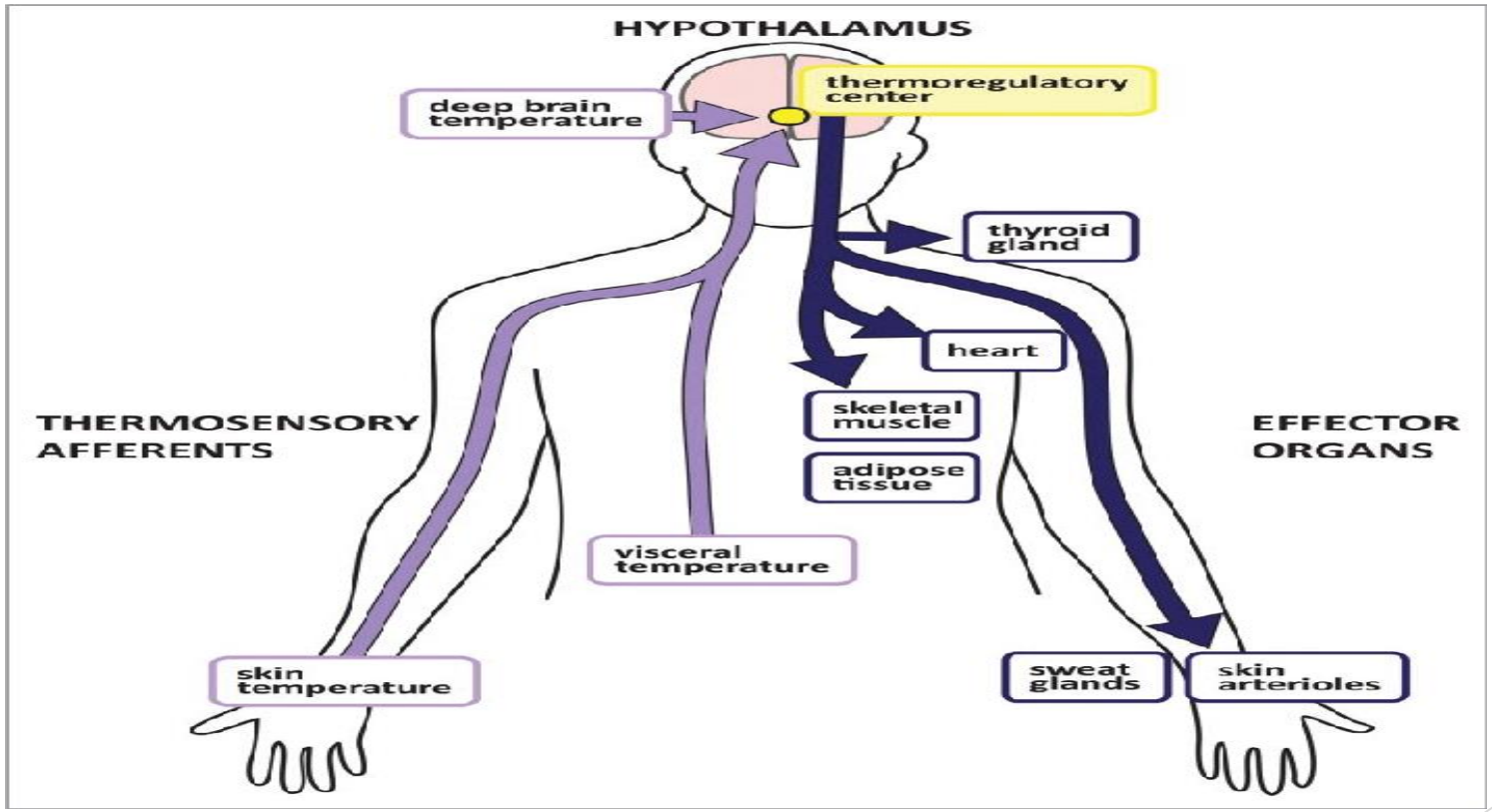
2. Osmoregulation

3. Chemical regulation

1. Thermoregulation

- Thermoregulation is the process occurring inside the body that is responsible for *maintaining the core temperature* of the body.

- Different homeostatic processes like sweating, dilation of blood vessels counteract the increased body temperature, whereas processes like contraction of blood vessels, and breakdown of adipose tissue to produce heat prevent the decreased body temperature.



2. Osmoregulation

- Osmoregulation is the process of *maintaining a constant osmotic pressure* inside the body by balancing the concentration of fluids and salts.
- During this process, excess water or ions or other molecules like urea are removed from the body to maintain the osmotic balance.
- One classic example of this process is the removal of excess water and ions out of the blood in the form of *urine* to maintain the osmotic pressure of the blood.
- The *rennin-angiotensin system* and other hormones like antidiuretic hormones act as a messenger for the electrolytic regulation system of the body.

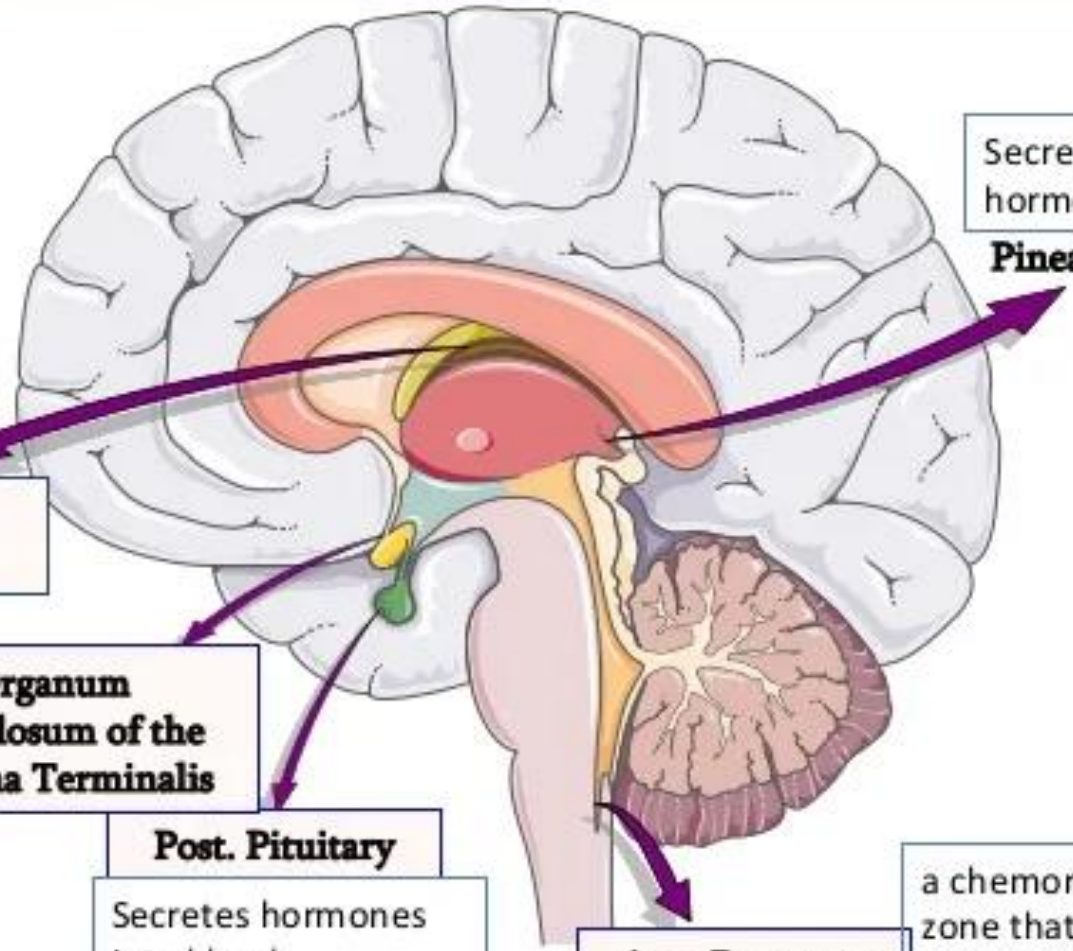
Forebrain osmotic regulation of the sympathetic nervous system

Osmosensitive sites (osmoreceptors) within the forebrain lamina terminalis, such as the organum vasculosum of the lamina terminalis =======>>

1) hypothalamic paraventricular nucleus (PVH) =====➔ Increased Sympathetic Nerve Activity

2) Osmoregulatory circuits for thirst and secretion of ADH

Circumventricular Organs



Secretes melatonin hormone into blood

Pineal Body

Circulating angiotensin II acts here to increase water intake

Subfornical Organ

Organum Vasculosum of the Lamina Terminalis

Osmoreceptor controlling vasopressin secretion and thirst

Post. Pituitary

Secretes hormones into blood

Area Postrema

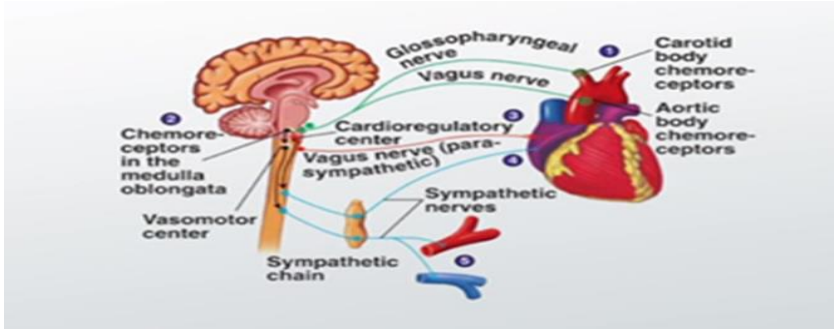
a chemoreceptor trigger zone that initiates vomiting in response to chemical changes in the plasma

3. Chemical regulation

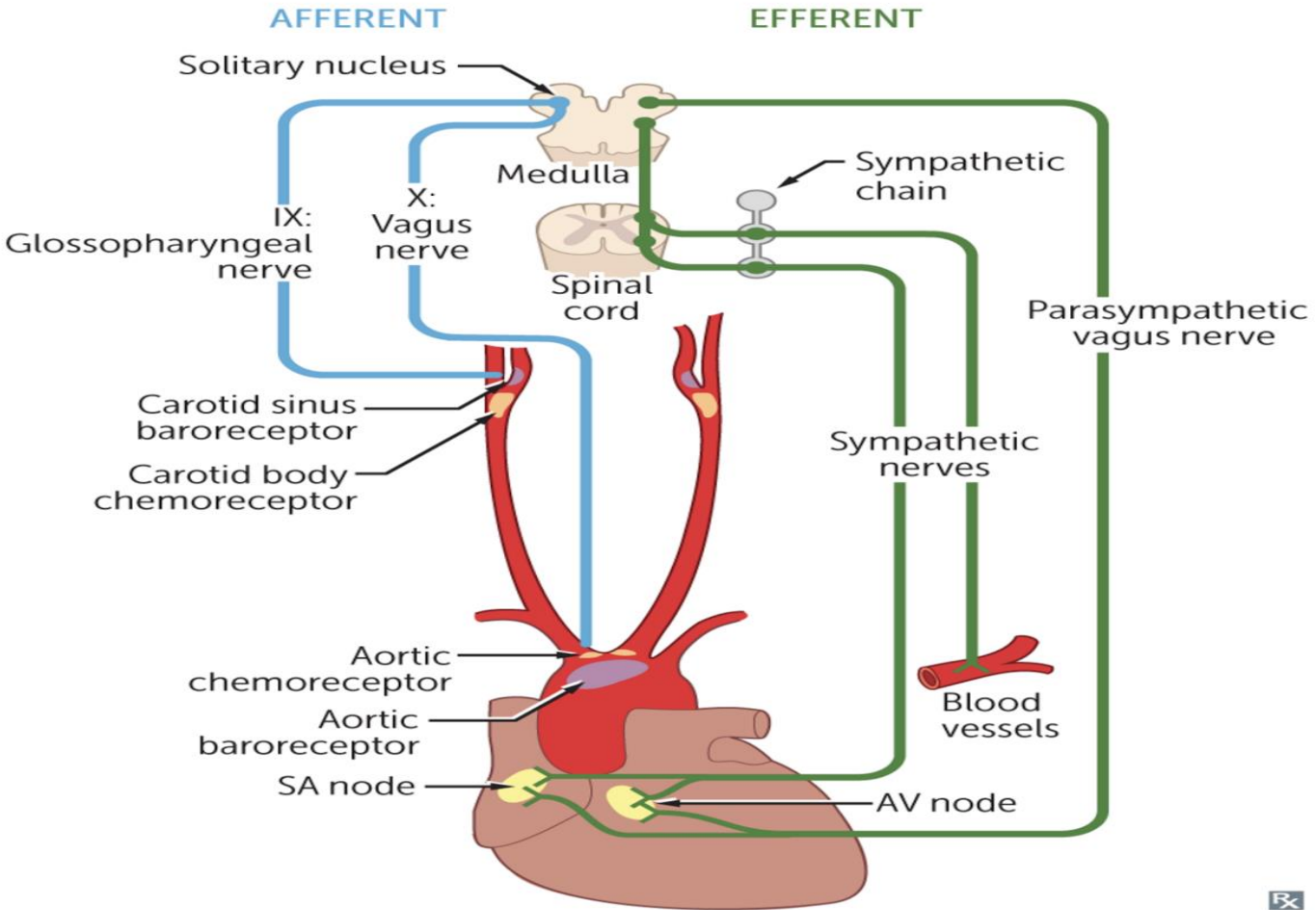
- Chemical regulation is the process of balancing *the concentration of chemicals* like glucose and carbon dioxide in the body.

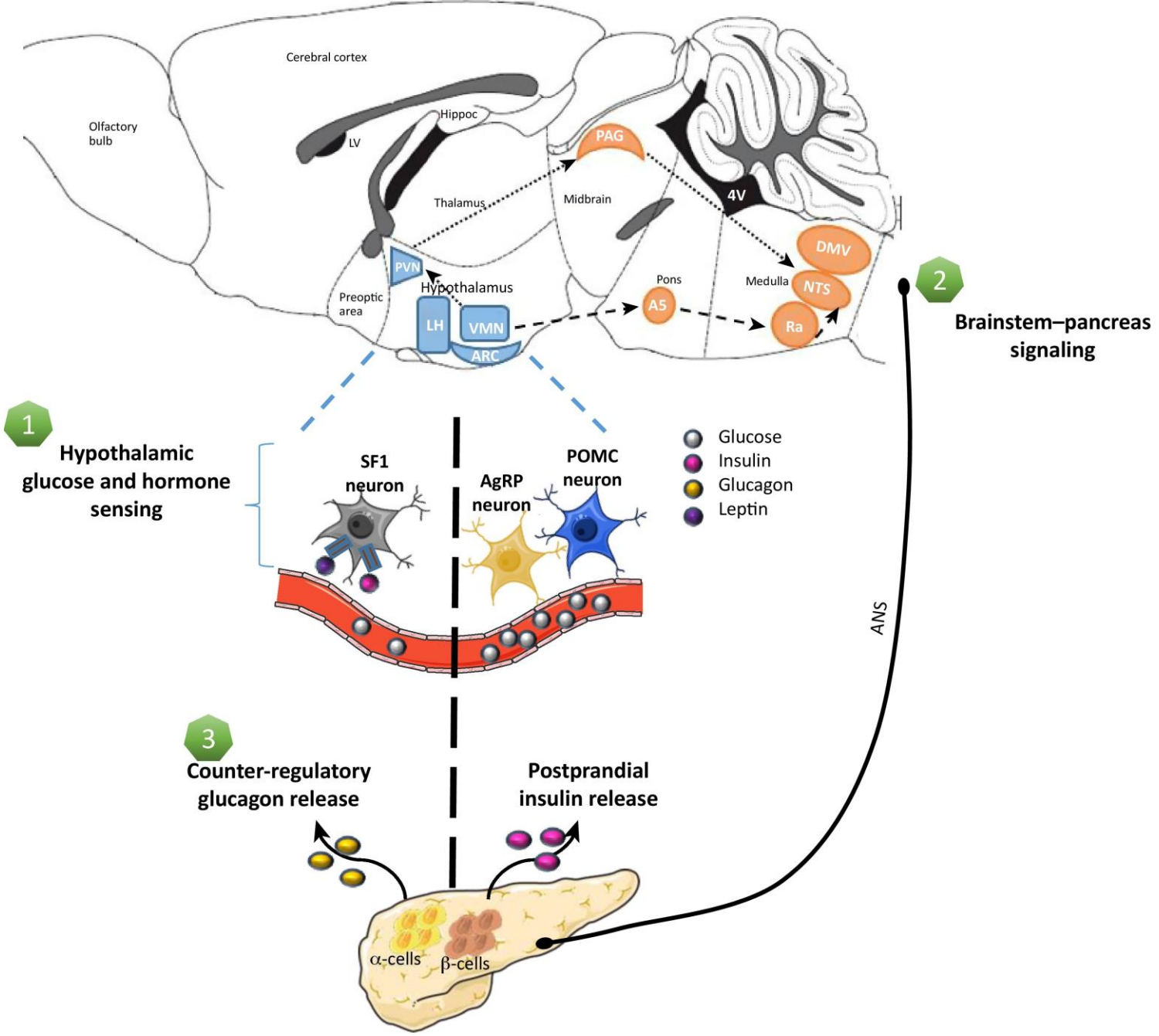
- Central *chemoreceptors are located in the medulla oblongata* of the brainstem. They detect changes in the arterial pressure of carbon dioxide (pCO2). When changes are detected, the receptors send impulses to the respiratory centers in the brainstem that initiate changes in ventilation to restore normal pCO2.

- *Glucose-sensitive neurons* are a subset of specialized cells in the *hypothalamus* that exhibit specific excitatory or inhibitory firing in response to changes in extracellular levels of glucose



Baroreceptors and chemoreceptors



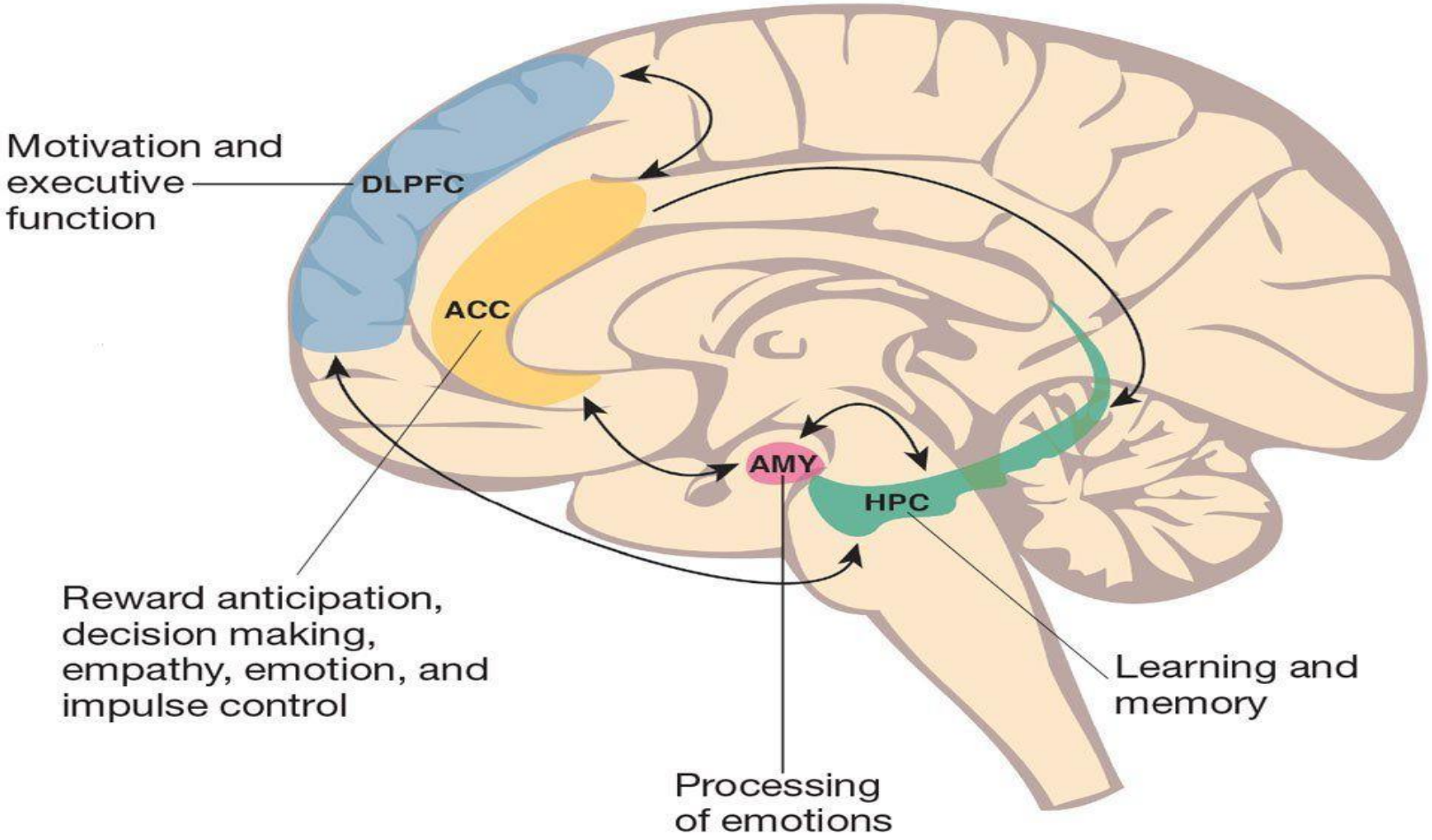


Trends in Endocrinology & Metabolism

Subjective wellbeing/good feeling homeostasis

- the systematic management of *the good feeling* and *positive feelings about our self*, known as subjective wellbeing (SWB).
- Provide a level of positive/activated mood and normal energy, with no sense of pain and distress

Figure 1. Corticolimbic system



DLPFC, dorsolateral prefrontal cortex; ACC, anterior cingulate cortex; AMY, amygdala; HPC, hippocampus.

Medical Conditions Associated with Dementia

- Fever
- Dehydration
- Electrolyte disturbances
- Infections
- GI problems
- Cardiovascular Complications
- Mood disorders
- Anxiety disorders
- Dellusions/Hallucinations

Peripheral nerve involvement in dementias

- Patients frequently show evidence of abnormalities in the way they sense or react to pain.
- The autonomic nervous system involvement
- Dementia alzheimer's type is found among people with Peripheral neuropathy, especially for people who are female, 60+ old