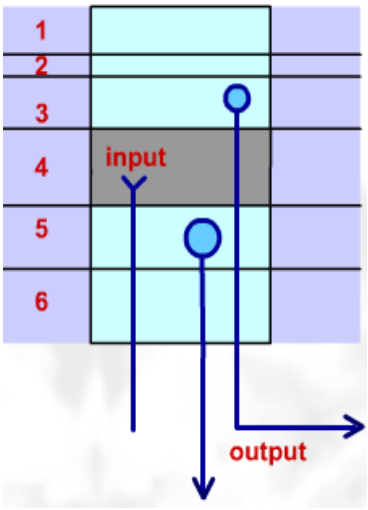
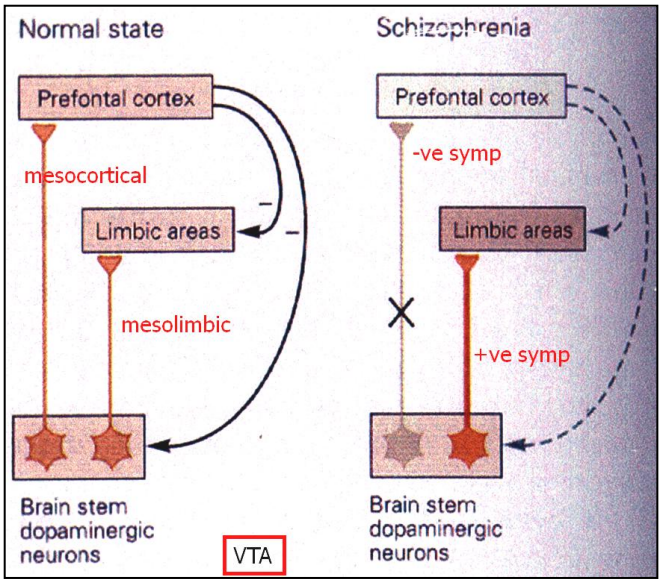
Unit VIII – Problem 12 – Physiology: Schizophrenia

- **The grey matter of the brain consists of six layers:**
  - **All sensory inputs will arrive to layer 4** (it is the thickest layer in the primary sensory cortex and primary visual cortex).
  - **While output fibers will emerge from layers 3 and 5** (these two layers are thickest in primary motor cortex).



- **Association areas**: are those which interpret information more than primary areas. the functions of these association areas include:
  - Voluntary movement.
  - Sensory perception.
  - Cognition.
  - Emotional behavior.
  - Memory.
  - Language.
- **Generally, there are three association areas:**
  - **Limbic association area**: composed of two parts:
    - ✓ Orbito-frontal: involved in emotions. If there is a lesion in this area, a person will lose anger and aggressiveness
    - ✓ Inferior temporal lobe: involved in memory.
  - **Prefrontal association area**: it is involved in cognitive behavior and motor planning. There is a center which can distinguish between reality and fiction (e.g. a person with a great ability of imagination → frontal lobe is not dominating).
    - ✓ If someone undergoes frontal lobotomy, anything which is related to thinking, remembering, solving problems, reasoning or judgment will be affected (the person might also become selfish or rude with many other behavioral changes).
    - ✓ The first frontal lobotomy procedure was done in 1935 on a chimpanzee. Then Egaz Moniz started doing the procedure in 1936 in aggressive humans (to calm them down). He received Nobel prize in 1949.
  - **Parietal-temporal-occipital area**: which is involved in language comprehension (Wernicke's area) and attention (example: hemispatial neglect).
- **Schizophrenia (ليس انفصام في الشخصية كما هو متعارف بين الناس إنما هي انفصام الشخص عن الواقع):**
  - The patient is dissociated from reality.
  - **Difference between some terminologies:**
    - ✓ Delusion = false belief (example: a person waking up in the morning believing he became a prophet!)
    - ✓ Illusion = false perception of external stimuli.
    - ✓ Hallucination = perception of non-existing stimuli.
    - ✓ Delirium = including all above symptoms but acutely.
  - **Very important: in schizophrenia, there are positive and negative symptoms:**
    - ✓ Positive symptoms (in which the patient acquires new things which are not normally existed): so he starts suffering from:
      - ❖ Delusions (false believes).
      - ❖ Hallucination (false perception of external stimuli).
      - ❖ Disorganized thinking or speech (person becomes talkative)
      - ❖ Disorganized behavior.
    - ✓ Negative symptoms:
      - ❖ Catatonic behavior: not moving.
      - ❖ Blunted effect: no emotions.
      - ❖ Alogia: reduced speech
      - ❖ Avolition: lacking motivation.
      - ❖ Anhedonia: lacking pleasure and interest in life.

- **Patho-physiology:**
  - ✓ In schizophrenia, there is dopaminergic defect. Normally, dopamine is secreted from VTA (Vental Tegmental Area) and there will be two important pathways from this area:
    - ❖ One is going to the cortex and known as *mesocortical system.*
    - ❖ And another one which is going to the limbic system and known as *mesolimbic system.*



  - ✓ Normally, the prefrontal cortex is inhibiting the limbic area. In schizophrenia, there will be defect in mesocortical system → leading to defect in prefrontal area → which further results in overactivity of the limbic system.
  - ✓ Defect in mesocortical system results in negative symptoms of schizophrenia.
  - ✓ While over activity in mesolimbic system results in positive symptoms of schizophrenia.
  - ✓ Treatment with dopamine is beneficial in treating negative symptoms of schizophrenia but not in treating positive symptoms.
  - ✓ Things which can increase dopamine synthesis in result in psychosis:
    - ❖ L-DOPA: considered as a precursor which increases dopamine synthesis.
    - ❖ Amphetamine: stimulating more release of dopamine from synaptic terminals.
    - ❖ Cocaine: inhibition of dopamine reuptake.
    - ❖ Substance which Inhibit enzymatic degradation of dopamine by monoamine oxidase (MAO).
  - ✓ Nowadays, schizophrenia is not only thought to be resulting from excessive in dopamine (as in the past) → but many other neurotransmitters are involved in addition to dopamine (such as ↑ serotonin).

- **Neuromodulator**: it is a chemical which is not only affecting a single neuron but regulating diverse populations of neurons. They are not reabsorbed or broken-down so they stay for a long time. Examples include: NE, dopamine, serotonin and Ach.
- **Neurotransmitters which are controlling our behavior:**
  - **Dopamine**: produced from ventral tegmental area (VTA). Notice that dopamine is controlling prolactin hormone.
  - **Serotonin**: produced from Raphe nucleus. 90% of serotonin is present in the GIT. It is the neurotransmitter responsible for happiness.
  - **Norepinephrine**: produced from locus ceruleus and lateral tegmental system.
  - **Histamine**: produced from tuberomammillary nucleus.
  - **Acetylcholine**: produced from laterodorsal tegmental nucleus, pedunculopontine tegmental nucleus and basal forebrain complex.