Limbic System
Limbic System

Parts of cortical, sub-cortical structures forming ring around upper end of brain stem

Plays vital role in

- Emotions
- Behaviour
- Drive-
- Memory
Hippocampus and Fornix
Schema of Fornix

- Columns of fornix
- Body of fornix
- Commissure of fornix
- Mammillary bodies
- Crura of fornix
- Amygdaloid bodies
- Fimbria of hippocampus
- Hippocampus
Limbic System

Three main components

• Cortical structures
• Sub-cortical nuclei
• Fibre bundles
Limbic System

Cortical structures

Limbic lobe-
- Cingulate gyrus
- Isthmus
- Parahippocampal gyrus
- Uncus (ento rhinal cortex)

Hippocampal formation
- Hippocampus
- Dentate gyrus
- Indusium griseum
Limbic System

Subcortical nuclei

- Amygdaloid nuclear complex – somatic response to internal needs, fear, drive/instincts (smell mediated sexual behaviour)
- Septal region & nuclei (pleasure zone)
- Olfactory areas (olfactory nerve, tract, stria)
- Hypothalamus esp. mammillary bodies
- Anterior nucleus of thalamus
Limbic System

Fibre bundles

- Fornix
- Mammillothalamic tract
- Stria medullaris thalami
- Stria terminalis
- Anterior commissure
- Cingulum
- Diagonal band (broca)
Limbic System

Functions

• Integration of olfactory, visceral and somatic impulses
• Hunger, food and eating behaviour
• Sexual behaviour
• Emotional behaviour (cingulate gyrus)
• Recent memory (hippocampus)
• Perception of fear (amygdaloid)
• Drug dependence (septal nucleus)
Vision
Hearing
Touch

- Frontal association cortex
- Temporal association cortex
- Limbic system
- Hypothalamus
- Parieto-occipital association cortex
Main Inputs
- Olfactory
- Visceral
- Somatic

Output
- Midbrain
- Reticular formation

Autonomic centers in Brain stem & spinal cord
OLFACTORY SYSTEM

1. Cell bodies are located in surface epithelium.
2. Axons of primary afferents enter cerebral cortex directly.
3. Primary neurons are replaced continuously.
4. Olfactory pathway is ipsilateral.
Frontal lobe

Olfactory bulb

Olfactory tract

Lateral olfactory stria

Optic nerve

Optic tract

Anterior perforated substance

Parahippocampal gyrus

Uncus

Crus cerebri

Pons

Mammillary body
Medial stria

Paraterminal gyrus

- Lateral stria

Continue with gyrus semilunaris (cortico-median – Amygdaloid body)

- Pyriform lobe (uncus & ant. Part of parahippocampal gyrus)

- Primary olfactory cortex
Papez Circuit – for emotional integration & recent memory

Fig. 16.8 The interconnection of limbic structures which constitute the Papez circuit.
Fig. 16.4 The principal parts of the limbic system and their relationship with the hypothalamus.
Fig. 16.6 The interconnections between associative neocortical regions and the component parts of the limbic system.
Fig. 16.7 *Transverse section through the hippocampus and inferior horn of the lateral ventricle.*
Hippocampus and Fornix
Coronal Section - Posterior View

- Fimbria of hippocampus
- Optic tract
- Hippocampal sulcus
- Dentate gyrus
- Hippocampus
- Alveus of hippocampus
- Temporal (inferior) horn of lateral ventricle
- Choroid plexus
- Tail of caudate nucleus