PHYSIOLOGICAL ANATOMY OF HYPOTHALAMUS (LOCATION & BOUNDARIES)

⇒ DIENCEPHALIC STRUCTURE

⇒ BELOW THE THALAMUS

⇒ SEPERATED FROM THALAMUS BY HYPOTHALAMIC SULCUS

⇒ FORMS ANTERO-INFERIOR WALL AND FLOOR OF 3RD VENTRICLE

⇒ **BOUNDARIES**:-

ANT :- OPTIC CHIASM
POST :- MAMMILLARY BODIES
LAT :- INTERNAL CAPSULE

HYPOTHALAMIC NUCLEI

(1) PREOPTIC AREA:-
- PREOPTIC NUCLEUS

(2) ANTERIOR (SUPRAOPTIC) AREA:-
a) SUPRAOPTIC NUCLEUS
b) SUPRACHIASMATIC NUCLEUS
c) PARAVENTRICULAR NUCLEUS
d) ANTERIOR NUCLEUS.

(3) MIDDLE (TUBERAL) AREA :-
a) VENTROMEDIAL NUCLEUS
b) DORSOMEDIAL NUCLEUS
c) ARCUATE NUCLEUS

(4) POSTERIOR (MAMMILLARY) AREA :-
a) MAMMILLARY BODY
b) POSTERIOR NUCLEUS

(5) LATERAL AREA :-
- LATERAL NUCLEUS

FUNCTIONS OF HYPOTHALAMUS :-

1) BODY TEMP. REGULATION
2) REGULATION OF ANT. PITUITARY GLAND ACTIVITY
3) FORMATION OF POST. PITUITARY GLAND & REGULATION OF THEIR SECRETN
4) CIRCADIAN RHYTHM
5) SLEEP-WAKE CYCLE
6) HUNGER AND FEEDING
7) CONTROL AND INTEGRATION OF ANS
8) CONTROL OF WATER INTAKE AND SENSATION OF THIRST
9) INTEGRATION OF CONTROL OF CVS
10) REGULATION OF UTERINE CONTRACTILITY & MILK EJECTION FROM BREAST.

1) REGULATION OF BODY TEMP.

- BY **PREOPTIC AREA**

VIA → ANT. HYPOTHALAMUS

↑ BODY TEMP (⊕) →
- PANTING
- SWEATING
- VASODILATION

⇩

HEAT LOSS

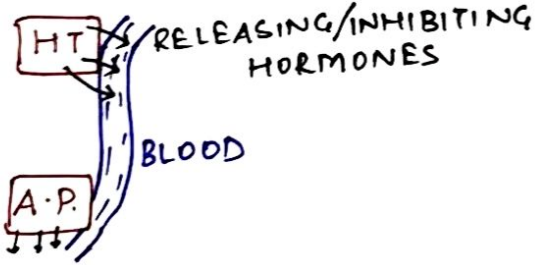
VIA → POST. HYPOTHALAMUS

↓ BODY TEMP. (⊕) →
- SHIVERING
- VASOCONSTRICTION

⇩

HEAT MAINTAINENCE

2) REGULATION OF ANT. PITUITARY GLAND



3) FORMATION OF POST. PITUITARY HORMONES & REGULATION OF THEIR SECRETN.

ADH OXYTOCIN

SYNTHESIS OF ADH ⇒ **SUPRAOPTIC NUCLEUS**

↓ NEUROPHYSIN II (MAGNOCELLULAR NEUROSECRETORY NEURONS)

STORAGE OF ADH ⇒ POSTERIOR PITUITARY

SYNTHESIS OF OXYTOCIN ⇒ **PARAVENTRICULAR NUCLEUS**

↓ NEUROPHYSIN I (MAGNOCELLULAR NEUROSECRETORY SYSTEM)

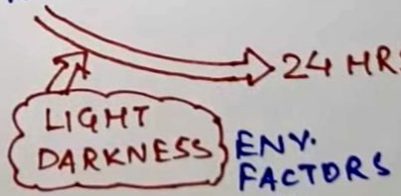
STORAGE OF OXYTOCIN ⇒ POSTERIOR PITUITARY

4) CIRCADIAN RHYTHM

→ MAINTAINED BY **SUPRACHIASMATIC NUCLEUS (SCN)**

→ A LARGE NUMBER OF PHYSIOLOGICAL RHYTHM, IN BODY RUN IN A CYCLIC PATTERN THAT IS APPROX 25 HR

- BODY TEMP RHYTHM
- SLEEP- WAKEFULNESS
- SEC. OF ACTH, GH, MELATONIN.



SUPRACHIASMATIC NUCLEUS (SCN)

6) HUNGER AND FEEDING

LATERAL HT AREA → HUNGER

↓

BILATERAL LESION

⇓

- NO HUNGER (ANOREXIA)
- NO DESIRE FOR FOOD
- LETHAL STARVATION

VMN → SATIETY CENTRE [OPPOSES DESIRE OF FOOD]

↓

BILATERAL LESION

⇓

- EXCESSIVE EATING (HYPERPHAGIA)
- TREMENDOUS OBESITY (HYPOTHALAMIC OBESITY).

ADDITIONAL:-

ARCUATE NUCLEI

↓

2 NEURONS

⊕ ↙ ↘ ⊕

↑APETITE ↓APETITE

MAMMILLARY BODY

↓

- OVERALL GI ACTIVITY
- PATTERNS OF FEEDING REFLEXES
- SWALLOWING

7) CONTROL OF ANS

HYPOTHALAMUS K/A HEAD GANGLION OF ANS

⊕ → ANTERIOR HYPOTHALAMUS ⇩

PARASYM. RESPONSE

→ CONTRACTN OF URINARY BLADDER

⊕ → LATERAL HYPOTHALAMUS ⇩

SYMP. RESPONSE

→ ↑ IN B.P.

→ PUPILLARY DILATION

→ PILOERECTION

→ ↑ ADRENAL MEDULLARY SECRETION (FIGHT OR FLIGHT)

⊕ → MID-DORSAL AREA OF HYPOTHALAMUS ⇩

CHOLENERGIC SYMPATHETIC VASODILATION

⊕ → DORSOMEDIAL + POST. HT NUCLEUS ⇩

↑ ADRENAL MEDULLARY SECRETION.

9) CONTROL OF CVS

POSTERIOR HYPOTHALAMUS

LATERAL HYPOTHALAMUS

- ↑ ARTERIAL PRESSURE
- ↑ HEART RATE

PREOPTIC AREA

- ↓ ARTERIAL PRESSURE
- ↓ HEART RATE

10) REGULATION OF UTERINE CONTRACTILITY & MILK EJECTION FROM BREAST.

PARAVENTRICULAR NUCLEI

POSTERIOR PITUITARY

OXYTOCIN → ↑ CONTRACTILITY OF UTERUS (LABOUR CONTRACTION)

OXYTOCIN → ↑ CONTRACTION OF MYOEPITHELIAL CELLS ⇒ MILK EJECTN (SURROUNDING ALVEOLI OF)

SUMMARY OF FUNCTIONS OF HYPOTHALAMUS :-

1) BODY TEMP. REGULATION :- PREOPTIC AREA VIA ANT.HT, POST HT

2) REGULATION OF ANT. PITUITARY GLAND ACTIVITY :- BY RELEASING/INHIBITING HORMONES

3) FORMATION & REGULATION OF POST. PITUITARY GLAND :-
SUPRAOPTIC NUCLEUS ⇩ ADH , PARAVENTRICULAR NUCLEUS ⇩ OXYTOCIN

4) CIRCADIAN RHYTHM :- SCN

5) SLEEP-WAKE CYCLE :- SCN

6) HUNGER AND FEEDING :- LATERAL HT AREA (HUNGER) , VMN (SATEITY)

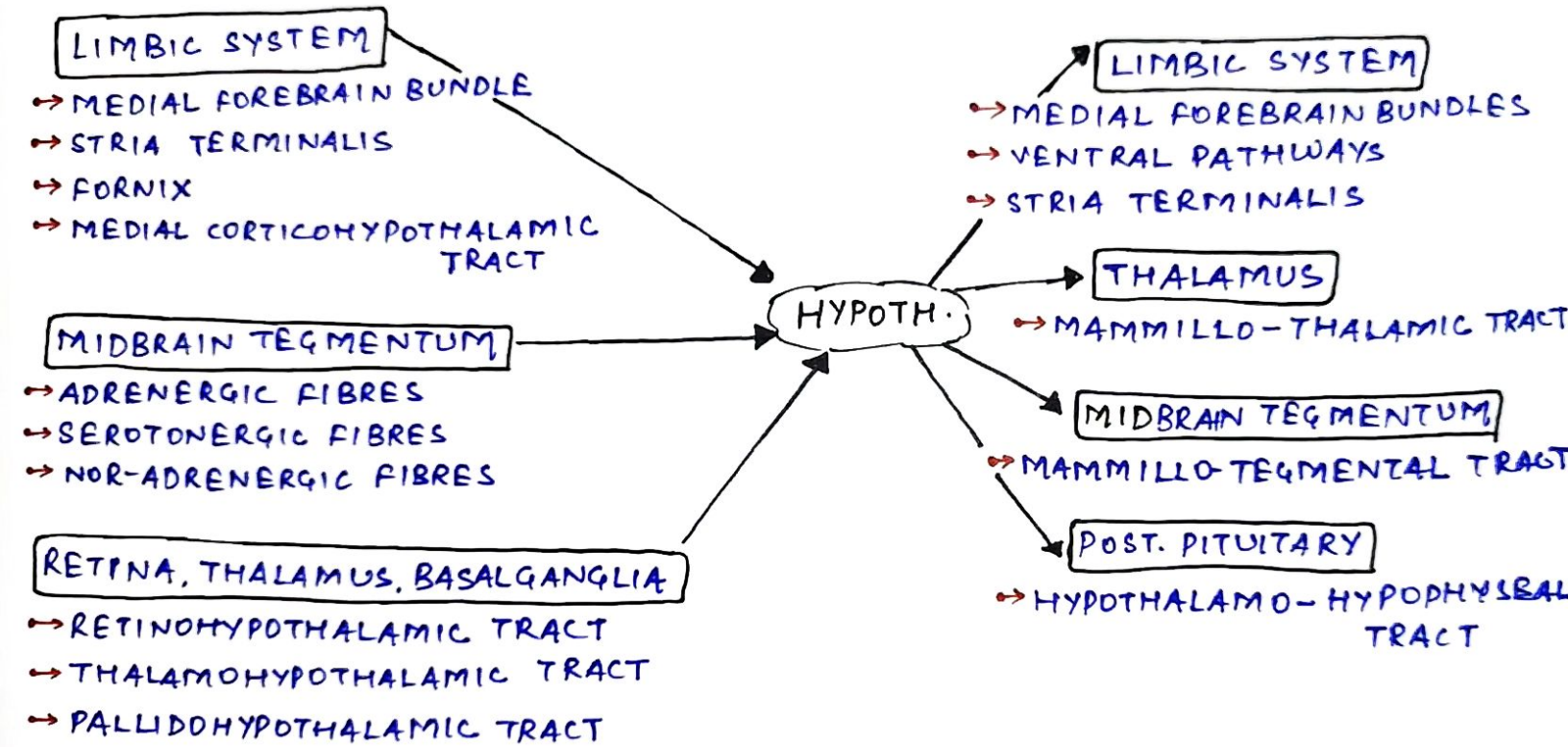
7) CONTROL OF ANS :- ANT. HYPOTH, LATERAL HYPOTH, MID-DORSAL HYPOTH , DORSOMEDIAL NUCLEUS + POST. HYPOTH

8) BODY WATER CONTROL :- LATERAL HYPOTH. (THIRST CENTRE), SUPRAOPTIC NUCLEI (ADH)

9) CONTROL OF CVS :- POST. HYPOTH & LATERAL HYPOTH , PREOPTIC AREA

10) UTERINE CONTRACTION & MILK EJECTION :- PARAVENTRICULAR NUCLEI

AFFERENT AND EFFERENT CONNECTIONS OF HYPOTHALAMUS



AFFERENT CONNECTIONS

- MEDIAL FOREBRAIN BUNDLE ⇒ PIRIFORM CORTEX TO LATERAL HYPOTH.
  AMYGDALA TO LATERAL HYPOTH.
  [VENTRAL PATHWAY]
- STRIA TERMINALIS ⇒ AMYGDALOID NUCLEUS TO VMN
- FORNIX
  - POST COMMISURAL FIBRES ⇒ HIPPOCAMPUS TO MAMMILLARY BODE
  - PRE COMMISURAL FIBRES ⇒ HIPPOCAMPUS TO LATERAL HYPOTH.
- MEDIAL CORTICOHYPOTHALAMIC TRACT ⇒ HIPPOCAMUS TO ARCUATE NUC
- ADRENERGIC FIBRES ⇒ MEDULLA TO VENTRAL HYPOTH.
- SEROTONERGIC FIBRES ⇒ RAPHE NUCLEUS TO HYPOTH.
- NOR-ADRENERGIC FIBRES ⇒
  - ANT. BUNDLE ⇒ NUCLEUS TRACTUS SOLITARIUS AND VENTEROLATERAL MEDULLA TO PARAVENTRI-CULAR N.
  - POST. BUNDLE ⇒ LOCUS CERULEUS TO DORSAL HYPOTH.
- RETINO-HYPOTH. TRACT ⇒ OPTIC N. FIBRE TO SCN

EFFERENT CONNECTIONS

MEDIAL FOREBRAIN BUNDLE ⇒ LATERAL HYPOTH. TO SEPTAL NUCLEI (RELAY) TO HIPPOCAMPUS

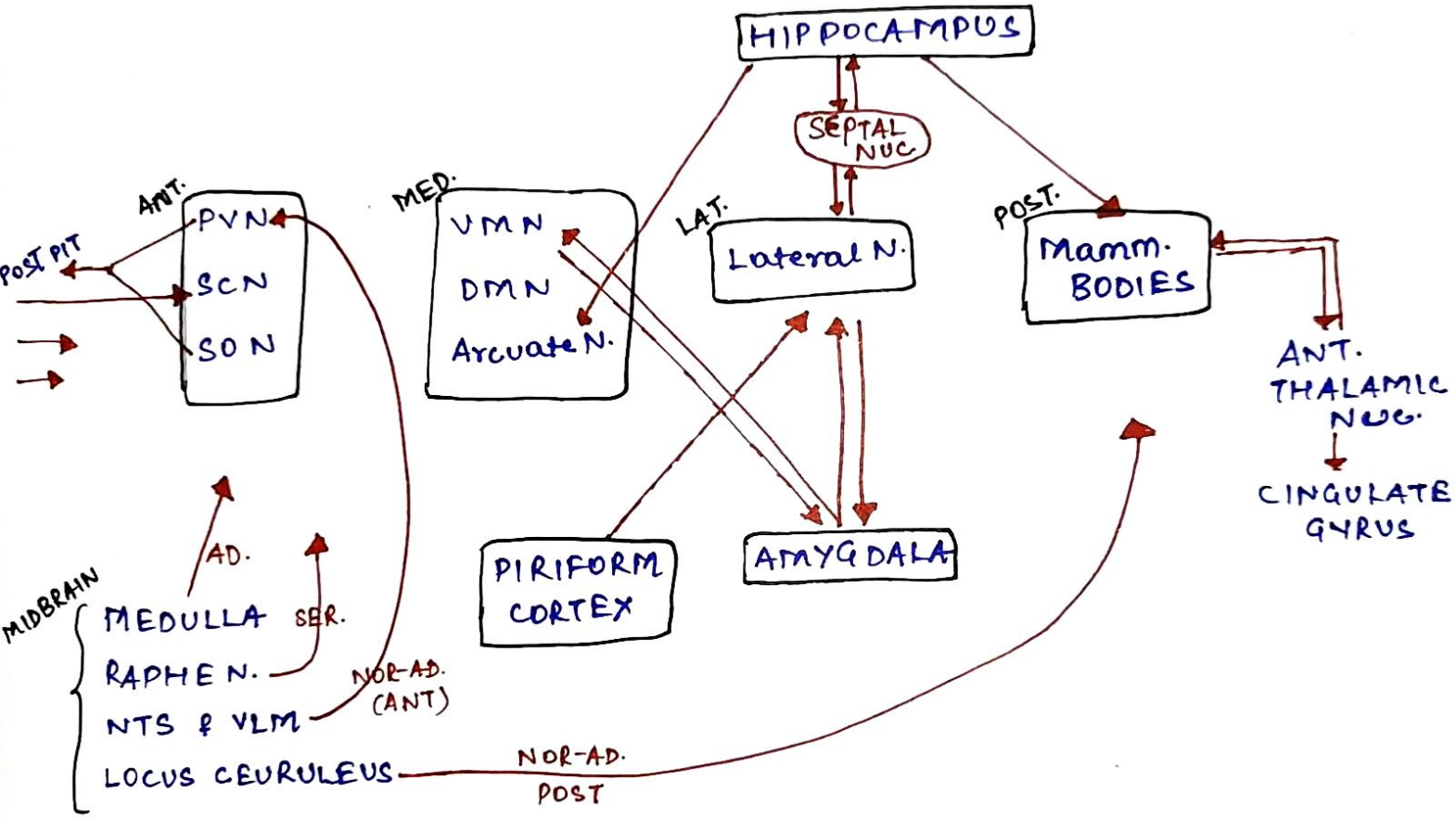
CENTRAL PATHWAYS ⇒ LATERAL HYPOTH. TO AMYGDALOID NUCLEUS

STRIA TERMINALIS ⇒ VMN TO AMYGDALOID NUCLEUS

MAMMILLO-THALAMIC TRACT ⇒ MAMMILLARY NUCLEUS TO ANT. THALAMIC NUCLEUS TO CINGULATE GYRUS

MAMMILLO-TEGMENTAL TRACT ⇒ HYPOTH. TO RETICULAR FORMATION OF MIDBRAIN

HYPOTHALAMO-HYPOPHYSEAL TRACT ⇒ SUPRAOPTIC N. & PARAVENTRICULAR N. TO POST. PITUITARY


HIPPOCAMPUS
SEPTAL NUC.
ANT.
PVN
SCN
SON
POST PIT
MED.
VMN
DMN
Arcuate N.
LAT.
Lateral N.
POST.
Mamm. BODIES
ANT. THALAMIC NUC.
CINGULATE GYRUS
PIRIFORM CORTEX
AMYGDALA
AD.
MIDBRAIN
MEDULLA
SER.
RAPHE N.
NTS & VLM
NOR-AD. (ANT)
LOCUS CEURULEUS
NOR-AD. POST