Hypothalamus

small, complex part of diencephalon
“crossroads” for many connections
with motor nuclei (somatic and autonomic) in brain stem and spinal cord
with cerebellum
with anterior and posterior pituitary
with hippocampus, amygdala, anterior nucleus of thalamus
with cerebral cortex and basal ganglia

integration into somatic motor, autonomic motor, endocrine and limbic activity

Structure and Location
Gross Anatomy
borders
front - lamina terminalis
back - mammillary bodies
upper - hypothalamic sulcus
tuber cinereum
median eminence
infundibular stalk
neurohypophysis (posterior pituitary)

Blood Supply - from vessels in Circle of Willis

Fig 23-3
Divisions
zones - divided at the fornix into lateral and medial zones
lateral zone
“lateral hypothalamic nucleus”
medial forebrain bundle

medial zone
more complex region with multiple nuclei

regions - media and lateral zones divided into three rostral to caudal regions,
more significant in medial zone

anterior region
tuberal region
posterior region
medial zone nuclei

anterior region
preoptic nuclei - sexually dimorphic; origin of gonadotropin releasing hormone;
(GnRH regulates release of gonadotropins from anterior pituitary)
suprachiasmatic nucleus - receives input from retina; circadian rhythm control
supraoptic and paraventricular nuclei - release of oxytocin and antidiuretic hormone
anterior nucleus - parasympathetic ANS; thermoregulation (heat dissipation)

tuberal region
dorsomedial and ventromedial nuclei - nutritional status and behavior
satiety (VM); destruction of VM, stimulation of DM = over-eating and sham rage
arcuate nucleus - a source of hypothalamic releasing factors
  growth hormone releasing hormone

posterior region
mammillary body - fornix fibers terminate; memory consolidation
posterior nucleus - sympathetic ANS; thermoregulation (heat conservation, heat production)
Functions
Hypothalamus Integrates Inputs and Helps Regulate Vital Activities
coordinates autonomic and endocrine responses to maintain stability of internal environment

metabolic regulation (feeding, metabolic rate)
ospotic regulation (drinking, kidney function)
temperature regulation (heat dissipation, heat production/conservation)

mediates emotion, somatic motor activity and behavior toward survival

entainment of circadian rhythms
reproduc
sleep
behavior
emotion

Hypothalamic “Centers”
example (page 215 in Fix)
ventromedial nucleus (VMN) - “satiety center”
stimulate VMN - stop eating
lesion VMN - eat and eat and eat ... plus RAGE!

lateral hypothalamus (LH) in tuberal region - “feeding center”
stimulate LH - eat
lesion LH - stop eating

a more general view

Autonomic Influence
anterior hypothalamus - activation of parasympathetic AMS
posterior hypothalamus - activation of sympathetic AMS

Thermoregulation
anterior hypothalamus - dissipation of heat, lesion leads to elevated temperature
posterior hypothalamus - conservation of heat; isolated lesion may lead to reduced
temperature, but generally leads to full loss of thermoregulation

Clinical Problems
pituitary tumors
 craniopharyngiomas
pituitary adenomas
visual disorder - impinging on optic chiasm

Wernicke encephalopathy
thiamine (vitamin B1) deficiency
three primary problems: eye movement disorder
ataxia
mental confusion and faulty memory

involves several structures: PAG, cerebellar vermis, mammillary bodies