Neuroendocrinology:
A guide for undergraduate education

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BSN
British Society for Neuroendocrinology

What is neuroendocrinology?

Neuroendocrinology is the branch of science that explores the complex interactions between the nervous system and the endocrine (hormonal) system, and how these interactions regulate various physiological processes in the body, including growth, metabolism, stress responses, reproduction, and behaviour.

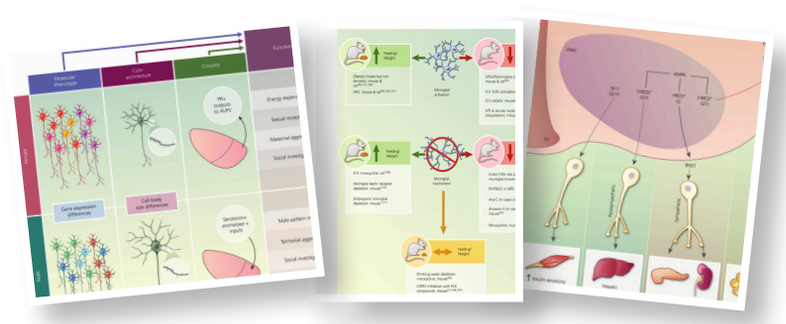
Research in neuroendocrinology aims to develop methods to beneficially regulate neuroendocrine function in humans and animals in the normal and diseased state.

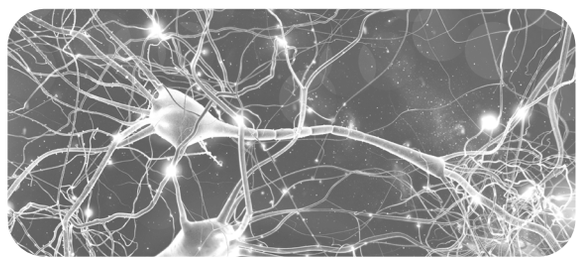
Transferrable skills: Targets

- Understanding of the principles of experimental design, data collection and statistical analysis.
- Critical thinking and evaluation
- Clear scientific writing
- Ability to synthesise primary research literature
- Awareness of the relative advantages of different preclinical research models and clinical trials.
- An appreciation of the ethical considerations in scientific research

Related fields

- Neuroscience
- Endocrinology
- Physiology
- Pharmacology
- Pathology
- Genetics
- Developmental biology
- Ecology
- Zoology
- Agriculture
- Animal behaviour





Free tools and resources

British Society for Neuroendocrinology: Neuroendocrine Briefings
neuroendo.org.uk

HHMI BioInteractive: Free educational materials (animations, videos, and classroom activities)
biointeractive.org

Khan Academy: Free video tutorials on neurobiology, endocrinology, and hormone regulation
Khanacademy.org

Society for Neuroscience: videos and resources
BrainFacts.org

National Neuroscience Curriculum Initiative
Nncionline.org

More information

For more information or to send us updates, email us at:

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Image DOI references L-R:
10.1111/jne.12801; 10.1111/jne.12838; 10.1111/ne.12773

Key concepts in neuroendocrinology

Molecular basis of hormone secretion and action in the CNS

- Pharmacological targets of hormone action in the CNS and PNS
- Endocrine regulation of neuronal and glial signalling
- Neuroendocrine regulation of hormone synthesis and release, including positive and negative feedback
- Neurophysiology of neuroendocrine and neurosecretory cells
- Mechanisms of hormone insensitivity and resistance

Functional anatomy of neuroendocrine systems

- Structure and function of neurosecretory and neuroendocrine cells
- Anatomy of neuroendocrine structures in the CNS: hypothalamus, pituitary gland and pineal gland
- Mechanisms of hormone entry into the CNS
- Peripheral target organs in neuroendocrine feedback loops

Neuroendocrinology and society

- Common diseases and disorders associated with altered neuroendocrine function
- Impact of the environment and society on neuroendocrine systems and related behaviours
- Conservation and differences in neuroendocrine systems across species
- Neuroendocrine regulation of social behaviour and cognition

Biological timekeeping

- CNS regulation of pulsatile (ultradian), daily (circadian) and annual (seasonal) rhythms
- Integration of information from internal and external cues in the regulation of biological rhythms
- Molecular mechanisms underlying biological timekeeping
- Interface between biological timekeeping and other neuroendocrine axes

Energy and fluid homeostasis

- CNS temperature, nutrient, sodium and water sensing mechanisms
- Hormonal regulation of neural systems controlling: metabolism, body temperature, hunger, thirst and osmolarity
- Communication between peripheral organs and the CNS to regulate energy and fluid homeostasis
- Interactions between neuroendocrine and autonomic pathways

Reproduction

- Neuroendocrine regulation of reproductive transitions: puberty and menopause
- Neuroendocrine regulation of ovarian cyclicity and gamete production
- Neuroendocrine regulation of pregnancy and lactation
- Hormonal regulation of sexual behaviour and parental nurture.
- Neuroendocrine basis of sex and gender

Growth and development

- Development of neuroendocrine systems
- Neuroendocrine regulation of growth: Growth hormone axis and insulin-like growth factor
- Neuroendocrine regulation of the skeleton
- Neuroendocrine influence on the *in utero* environment
- Thyroid hormone axis

Stress

- Neuroendocrine response to physiological, psychological and environmental stressors: Hypothalamic-pituitary-adrenal axis and sympathetic nervous system
- Systemic influence of stress on neuroendocrine and wider physiological functions
- Neural stress response circuits

Acronyms

CNS - Central Nervous System | PNS - Peripheral Nervous System