Health and stress

Endocrinology IV

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Transport of hormones in the circulation and their half-lives

- **Steroid and thyroid hormones** are less soluble in aqueous solution than protein and peptide hormones and over 90% circulate in blood as complexes bound to specific plasma globulins or albumin.
- **Bound and free hormones are in equilibrium.**
- More recently, **binding proteins for** several protein and peptide **hormones** (e.g. CRH, GH) as well as growth factors (e.g. IGF) have also **been identified**.

Neuroendocrine interactions

- All endocrine glands are innervated by autonomic nerves.
- these may either directly control their endocrine function and/or regulate blood flow (and hence function) within the gland.

- Hormones, in turn, may affect central nervous system functions such as mood, anxiety and behavior.

- Neurosecretory cells may directly convert a neural signal into a hormonal signal.

- **they act as transducers converting electrical energy into chemical energy.**

- Thus, activation of neurosecretory cells leads to secretion of a hormone into the circulation.

Hormones and the immune system

- Since the discovery that surgical ablation of the **pituitary gland** caused atrophy of the **thymus gland**, experimental evidence from animal studies has indicated that there is a complex network of interactions between these two systems.
- The **thymus gland**, which is essential for orchestrating immune responses, has **two regions** –
- one in which **T cell** precursors from bone marrow **mature** and
- the other **that secretes thymic hormones**.
- **The physiological role of thymic hormones is not clear but they are postulated to promote T cell maturation.**

Hormones, growth promotion and malignancy

- Many **hormones and growth factors promote growth** in fetal and post-natal life and, thus, it has been suggested that they **may also promote tumorigenesis**.
- Whilst it is known that many growth factors such as the **insulin-like growth factors** induce proliferation in both normal and malignant cells, their precise role in the development of malignancy is unknown.
- however, substantial evidence that **human cancers do not result from a single genetic event but from stepwise genetic changes** that result in the **activation of proto-oncogenes** and the **inactivation of** so-called **antioncogenes** or **tumor suppressor genes**.

Clinical evaluation of endocrine disorders

- In endocrinology patients come to attention for only two reasons - because of **excess hormone action or through its lack.**
- Each has a number of possible causes.
- Excessive amounts of a hormone may be secreted by tumors. The normal feedback loop may be reset so that the amount of hormone secreted is abnormal only in the context of the concentration of the variable that it controls.
- In some cases, the relevant hormone may, in fact, be absent but its receptor may be constitutively activated.
- there may be a non-physiological stimulator of the receptor such as an antibody.
- The post-receptor signal transduction pathway may contain an abnormal protein that signals continued receptor occupancy.
- Finally, excess hormone may be ingested accidentally, deliberately or, indeed, therapeutically.

- A lack of hormone effect may result from a lack of the hormone however caused (e.g. genetic deletion, damage to the endocrine gland, lack of a synthetic enzyme) or from the production of a biologically inactive hormone.
- The hormone receptor (or the down-stream signaling pathways) may be structurally abnormal and inactive leading to hormone resistance.
- **The pace of progress in endocrinology has always been dictated by the development of assays to measure the hormones.**

Reference

- Stephen Nussey and Saffron Whitehead, 2001,Endocrinology: An Integrated Approach, Oxford: BIOS Scientific Publishers;ISBN-10: 1-85996-252-1.