Endocrinology concerns the synthesis, secretion and action of hormones. These are chemical messengers coordinate the activities of many different cells. Some endocrine diseases are common, particularly those of the thyroid gland, reproductive system and β cells of the pancreas. For example, thyroid dysfunction occurs in more than 10% of the population in areas with iodine deficiency, e.g. the Himalayas, and 4% of women aged 20-50 years in the UK.
- System of ductless glands that secrete hormones
  - Hormones are “messenger molecules”
  - Circulate in the blood
  - Act on distant target cells
  - Target cells respond to the hormones for which they have receptors
  - The effects are dependent on the programmed response of the target cells
  - Hormones are just molecular triggers

- Basic categories of hormones
  - Amino acid based: modified amino acids (or amines), peptides (short chains of amino acids), and proteins (long chains of amino acids)
  - Steroids: lipid molecules derived from cholesterol
some endocrine glands (e.g. parathyroid glands and pancreas) respond directly to metabolic signals, most are controlled by hormones released from the **pituitary gland**. Anterior pituitary hormone secretion is controlled in turn by substances produced in the **hypothalamus** and released into portal blood which drains directly down the pituitary stalk. Posterior pituitary hormones are synthesised in the hypothalamus and transported down nerve axons to be released from the posterior pituitary.

Hormone release in the hypothalamus and pituitary is regulated by numerous stimuli of nervous, metabolic, physical or hormonal origin, in particular feedback control by hormones produced by the target glands (**thyroid, adrenal cortex and gonads**). These integrated endocrine systems are called 'axes
Endocrine Diseases

- TOO MUCH
- or
- TOO LITTLE
CLASSIFICATION OF ENDOCRINE DISEASE

- **Hormone excess** Primary gland over-production
- Secondary to excess trophic substance
- **Hormone deficiency** Primary gland failure
- Secondary to deficient trophic hormone
- **Hormone hypersensitivity** Failure of inactivation of hormone
- Target organ over-activity/hypersensitivity
- **Hormone resistance** Failure of activation of hormone
- Target organ resistance
PRESENTING PROBLEMS IN ENDOCRINE DISEASE
Blood pressure
- Hypertension in Cushing’s and Conn’s syndromes, phaeochromocytoma
- Hypotension in adrenal insufficiency

Pulse
- Atrial fibrillation
- Sinus tachycardia
- Bradycardia

Skin
- Hair distribution
- Dry/greasy
- Pigmentation/pallor
- Bruising
- Vitiligo
- Striae
- Thickness

Hands
- Palmar erythema
- Tremor
- Acromegaly
- Carpal tunnel syndrome

Head
- Eyes
  - Graves’ disease
  - Diplopia
  - Visual field defect (see opposite)
- Hair
  - Alopecia
  - Frontal balding
- Facial features
  - Hypothyroid
  - Hirsutism
  - Acromegaly
  - Cushing’s Mental state
  - Lethargy
  - Depression
  - Confusion
  - Libido

Neck
- Voice
  - Hoarse, e.g. hypothyroid
  - Virilised
- Thyroid gland (see opposite)
- Goitre
- Nodules

Breasts
- Galactorrhoea
- Gynaecomastia

Body fat
- Central obesity in Cushing’s syndrome and growth hormone deficiency

Bones
- Fragility fractures (e.g. of vertebrae, neck of femur or distal radius)

Genitalia
- Virilisation
- Pubertal development
- Testicular volume

Vitiligo in organ-specific autoimmune disease
- Pigmentation of creases due to high ACTH levels in Addison’s disease
**Observation**

- Most examination in endocrinology is by observation.
- Astute observation can often yield 'spot' diagnosis of endocrine disorders.
- The emphasis of examination varies depending on which gland or hormone is thought to be involved.
<table>
<thead>
<tr>
<th>Symptom</th>
<th>Most likely endocrine disorder(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lethargy and depression</td>
<td>Hypothyroidism, diabetes mellitus, hyperparathyroidism, hypogonadism, adrenal insufficiency, Cushing's syndrome</td>
</tr>
<tr>
<td>Weight gain</td>
<td>Hypothyroidism, Cushing's syndrome</td>
</tr>
<tr>
<td>Weight loss</td>
<td>Thyrotoxicosis, adrenal insufficiency, diabetes mellitus</td>
</tr>
<tr>
<td>Amenorrhoea/oligomenorrhoea</td>
<td>Menopause, polycystic ovarian syndrome, hyperprolactinaemia, thyrotoxicosis, premature ovarian failure, Cushing's syndrome</td>
</tr>
<tr>
<td>Polyuria and polydipsia</td>
<td>Diabetes mellitus, diabetes insipidus, hyperparathyroidism, Conn's syndrome</td>
</tr>
<tr>
<td>Heat intolerance</td>
<td>Thyrotoxicosis, menopause</td>
</tr>
<tr>
<td>Palpitations</td>
<td>Thyrotoxicosis, phaeochromocytoma</td>
</tr>
<tr>
<td>Thyroid nodule</td>
<td>Solitary thyroid nodule, dominant nodule in multinodular goitre</td>
</tr>
<tr>
<td>Generalised thyroid enlargement</td>
<td>Simple goitre (nodular or diffuse), Graves' disease, Hashimoto's thyroiditis</td>
</tr>
<tr>
<td>Pain over thyroid</td>
<td>Haemorrhage into nodule, de Quervain's thyroiditis</td>
</tr>
<tr>
<td>Prominence of eyes</td>
<td>Graves' disease</td>
</tr>
<tr>
<td>Hirsutism</td>
<td>Idiopathic, polycystic ovarian syndrome, congenital adrenal hyperplasia, Cushing's syndrome</td>
</tr>
<tr>
<td>Galactorrhoea</td>
<td>Hyperprolactinaemia</td>
</tr>
<tr>
<td>Loss of libido</td>
<td>Male hypogonadism</td>
</tr>
<tr>
<td>Visual dysfunction</td>
<td>Pituitary tumour</td>
</tr>
<tr>
<td>Headache</td>
<td>Acromegaly, pituitary tumour, phaeochromocytoma</td>
</tr>
<tr>
<td>Muscle weakness (usually proximal)</td>
<td>Thyrotoxicosis, Cushing's syndrome, hypokalaemia (e.g. Conn's syndrome), hyperparathyroidism, hypogonadism</td>
</tr>
<tr>
<td>Paraesthesiae and tetany</td>
<td>Hypoparathyroidism</td>
</tr>
<tr>
<td>Recurrent ureteric colic</td>
<td>Hyperparathyroidism</td>
</tr>
<tr>
<td>Coarsening of features</td>
<td>Acromegaly, hypothyroidism</td>
</tr>
</tbody>
</table>
INVESTIGATION OF ENDOCRINE

Timing of measurement • Release of many hormones is rhythmical (e.g. pulsatile....) so random measurement may be invalid and sequential or dynamic tests may be required

Choice of dynamic biochemical tests Abnormalities are often characterised by loss of normal regulation of hormone secretion
If hormone deficiency is suspected, choose a stimulation test
If hormone excess is suspected, choose a suppression test

Imaging
Secretory cells also take up substrates, which can be labelled

Biopsy Many endocrine tumours are difficult to classify histologically (e.g. adrenal carcinoma and adenoma)
Most hormones can be measured in blood, but the circumstances in which the sample is taken are often crucial, especially for hormones with pulsatile secretion (e.g. growth hormone) or marked physiological variation (e.g. diurnal variation of cortisol, or monthly variation of sex steroids in pre-menopausal women). Other investigations (e.g. imaging and biopsy) are usually reserved for patients who present with a tumour (e.g. in thyroid or pituitary) or in whom the biochemical diagnosis has already been made.