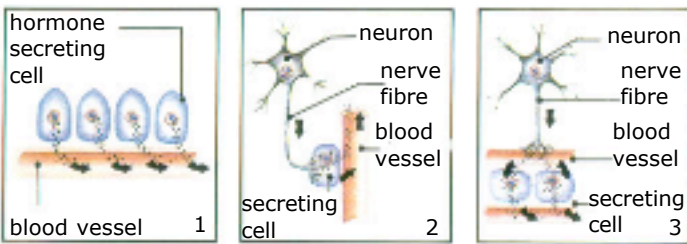
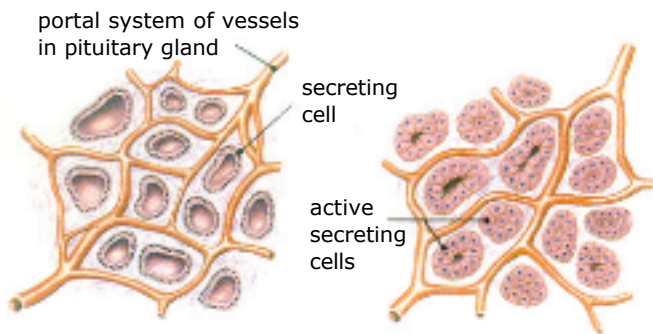


The Endocrine System 1

The endocrine glands (ductless) secrete hormones directly into the bloodstream. Hormones are complex chemical "messengers"; they are released in tiny amounts, yet they can produce dramatic changes in the activity of body cells (high efficacy). In this way they control basic body functions such as growth, metabolism and sexual development; they are also responsible for maintaining the correct levels in the blood of certain vital substances (e.g electrolytes).

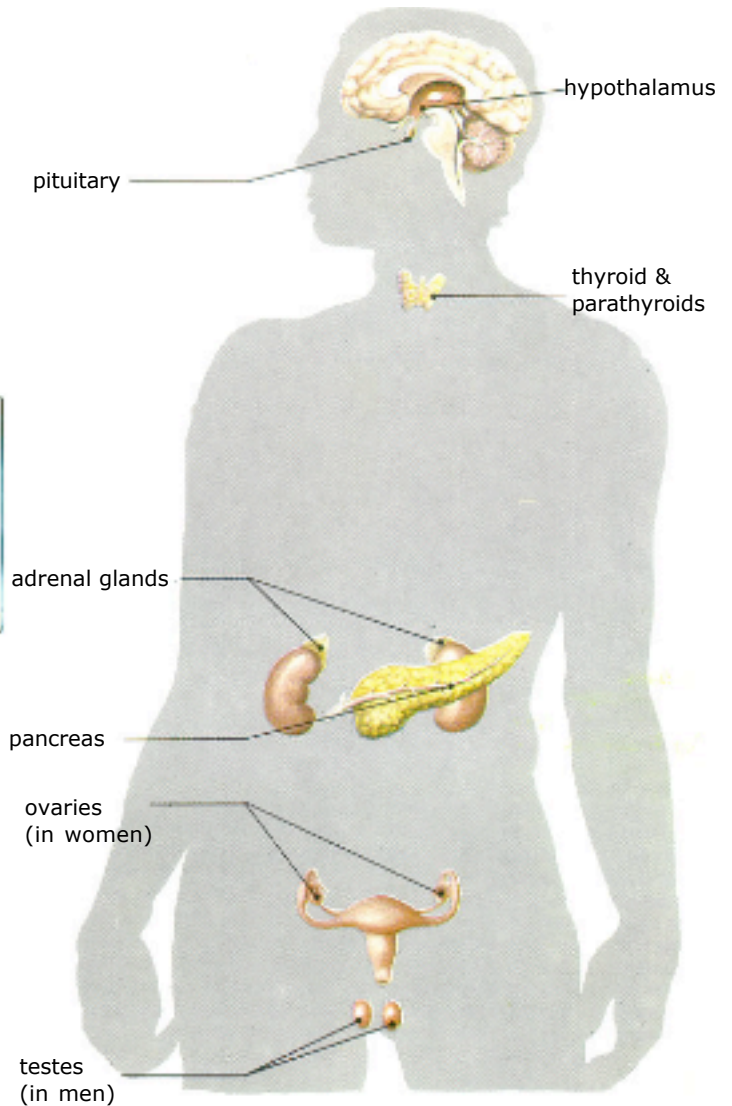
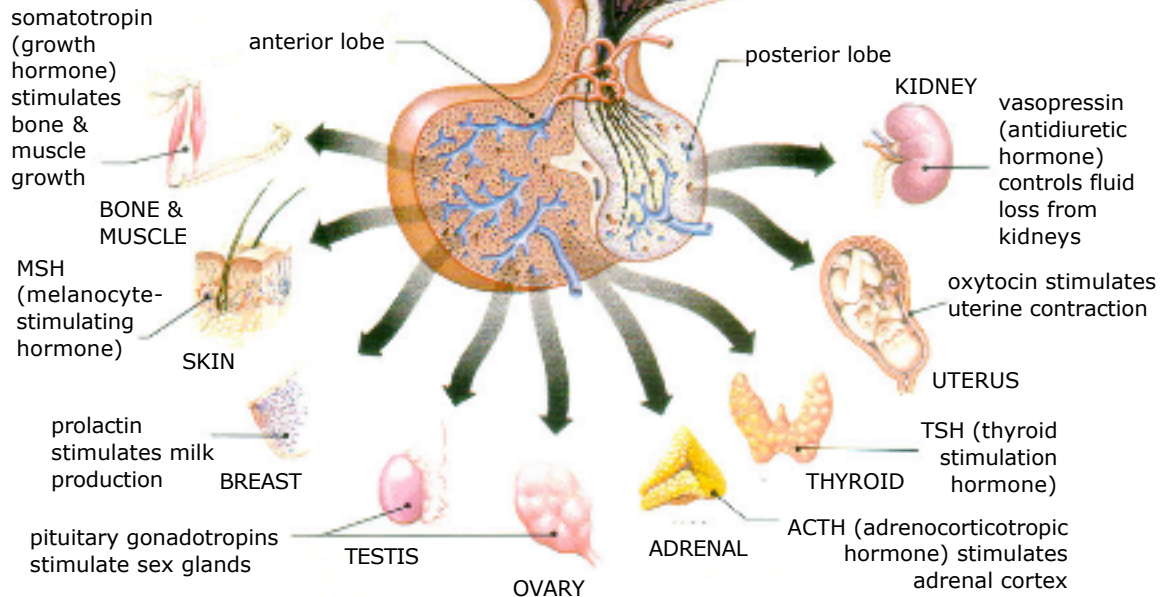


Hormones can be released into the bloodstream in a number of different ways. They may be released directly by a secreting cell (1) or when such a cell is stimulated by a nerve impulse (2). In the posterior lobe of the pituitary, nerve fibres themselves release hormones directly into the blood, which stimulate another hormone-producing cell (3)



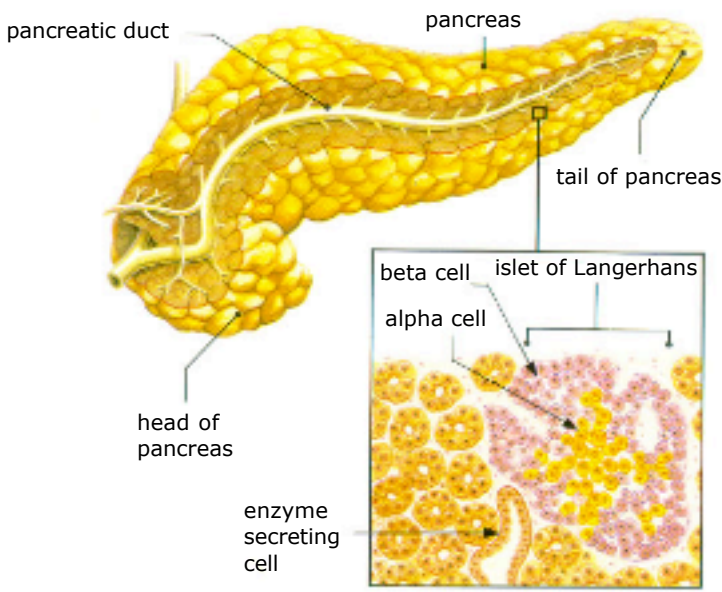
The anterior pituitary has a rich network of blood vessels connecting it to the hypothalamus. "neurosecretions" from the hypothalamus stimulate the hormone-secreting cells.

The pituitary gland (right) is situated at the base of the brain and is about the size of a pea; it is divided into lobes. It is subject to the influence of the hypothalamus, to which it is connected by a slender stalk. It releases a variety of hormones which act on several "target" organs. The hormones of the anterior lobe, with the exception of somatotrophin and MSH, stimulate other glands. The hypothalamus monitors the level of the hormones released by these glands and instructs the pituitary to cut off the stimulating hormone once the correct level is achieved.

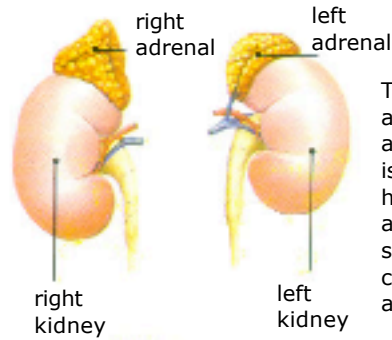


The secretion of hormones is controlled by a complex feedback mechanism in which the nervous system is closely involved. The hypothalamus and pituitary play particularly important roles.

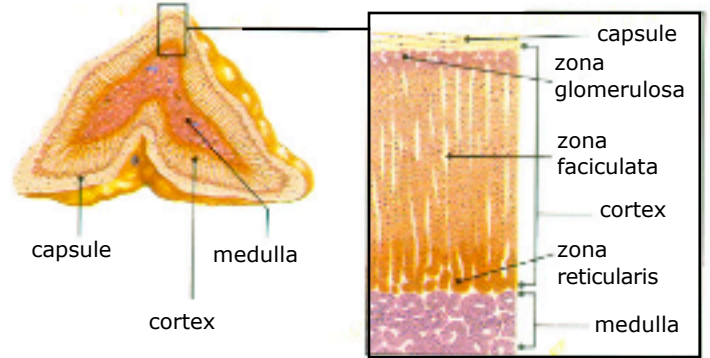
The Endocrine System 2



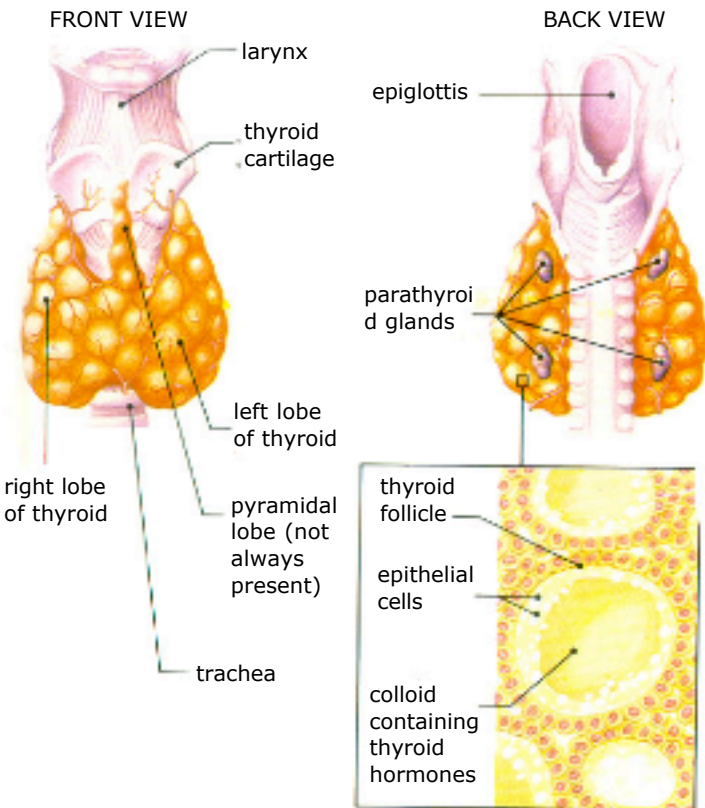
The pancreas, which lies behind and under the stomach, is a mixed-function gland; as well as containing cells which secrete digestive enzymes, it has clumps of cells known as the "islets of Langerhans" which secrete hormones. These are most numerous toward the tail or pointed end of the pancreas. The islets contain two types of cells; alpha and beta. The alpha cells produce the hormone glucagon, which raises blood sugar level; the beta cells secrete insulin, which lower blood sugar level. A lack of insulin as a result of disease or damage to the pancreas results in diabetes.



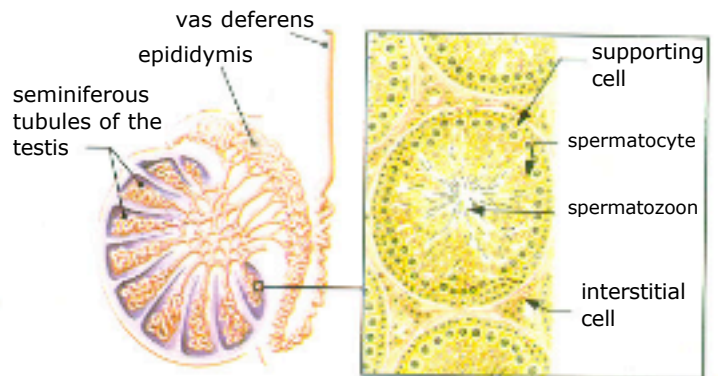
The adrenal glands produce a variety of hormones. The adrenal cortex (outer part) is stimulated by the pituitary hormone ACTH; it secretes a number of essential steroid hormones e.g cortisol, aldosterone and adrenal androgens.



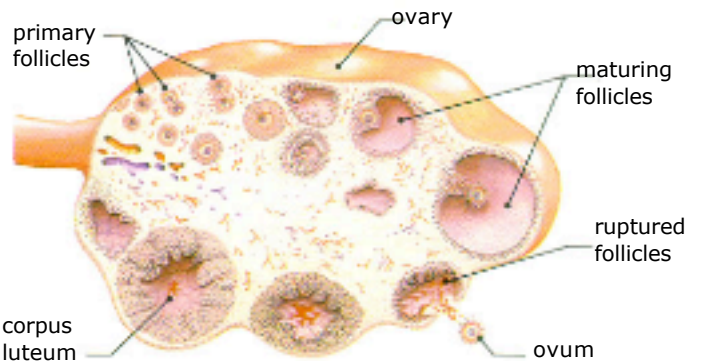
The adrenal medulla (inner part) is entirely separate in function from the cortex and is not influenced by the pituitary gland. It secretes adrenalin and noradrenalin in response to fear, anger or sexual desire; these prepare the body for instant action by increasing the heart rate and the blood supply to the muscles.



The thyroid gland is situated at the base of the neck on either side of the trachea, just below the larynx. It is made up of follicles containing a fluid called colloid, in which the two thyroid hormones thyroxine and triiodothyronine (T4 and T3) are stored for release into the bloodstream as necessary. These hormones control the body's metabolic rate. There are four small parathyroid glands situated behind the thyroid. These secrete parathyroid hormone, which primarily controls phosphorous and calcium levels in the blood.



The tubules of the testes contain cells called spermatocytes which, under the influence of gonadotropic hormones, mature into spermatozoa. These are stored in the tubules and epididymis until they are conducted to the penis at ejaculation by the vas deferens. The interstitial cells between the tubules also produce the male hormone testosterone, responsible for secondary sexual characteristics.



At birth, the ovaries contain numerous primary follicles; after puberty, these develop after complex hormonal control. At the mid-point of each menstrual cycle an ovum (egg cell) is released from the mature follicle, which then becomes a corpus luteum. If pregnancy occurs, this secretes hormones which interrupt the menstrual cycle.