

8.2 The endocrine system (hormonal glands)

We have a nervous system that keeps our body working in a coordinated way using electrical impulses. We have a second system, the endocrine system, which also controls and regulates our body using hormones. Hormones respond more slowly than our nerves but can have long lasting effects.

As an introduction, you can watch “Endocrine System, Part 1 - Glands & Hormones: Crash Course A&P #23” on You Tube www.youtube.com/watch?v=eWHH9je2zG4. It’s about 11 minutes long. It’s aimed at teenagers – and their humour, sorry – but it’s a relatively short, non-technical overview and I didn’t fall to sleep during it!

8.2.1 Hormones

- Hormones are chemical messengers that are released into the blood where they are carried to their destination cells or tissues.
- The term “hormone” comes from a Greek word meaning “to stir up”, and they work by increasing or decreasing the activity of their target cells and tissues.
- In doing that, they control many of the body’s processes and are critical in keeping the body stable and functioning (homeostatis). They also play key roles in growth and sexual reproduction.

Hormones are produced by endocrine glands and released from glandular tissue in other areas of the body (e.g. stomach, kidney, small intestine). Some hormones are released in multiple places in the body.

The following are some well known endocrine hormones¹:

Hormone	Secreting gland(s)	Function
adrenalin	adrenal	increases blood pressure, heart rate, and metabolism in reaction to stress
aldosterone	adrenal	controls the body’s salt and water balance
cortisol	adrenal	plays a role in stress response
dehydroepiandrosterone sulfate (DHEA)	adrenal	aids in production of body odour and growth of body hair during puberty
follicle stimulating hormone (FSH)	pituitary	controls the production of eggs and sperm

¹ Table from Jill Seladi-Schulman, “Endocrine System Overview”, www.healthline.com/health/the-endocrine-system, April 22, 2019

Hormone	Secreting gland(s)	Function
glucagon	pancreas	helps to increase levels of blood glucose
insulin	pancreas	helps to reduce your blood glucose levels
luteinizing hormone (LH)	pituitary	controls oestrogen and testosterone production as well as ovulation
melatonin	pineal	controls sleep and wake cycles
oestrogen	ovary, testis	works to regulate menstrual cycle, maintain pregnancy, and develop female sex characteristics; aids in sperm production
oxytocin	pituitary	helps with lactation, childbirth, and mother-child bonding
parathyroid hormone	parathyroid	controls calcium levels in bones and blood
progesterone	ovary	helps to prepare the body for pregnancy when an egg is fertilized
prolactin	pituitary	promotes breast-milk production
testosterone	ovary, testis, adrenal	contributes to sex drive and body density in males and females as well as development of male sex characteristics
thyroid hormone	thyroid	help to control several body functions, including the rate of metabolism and energy levels

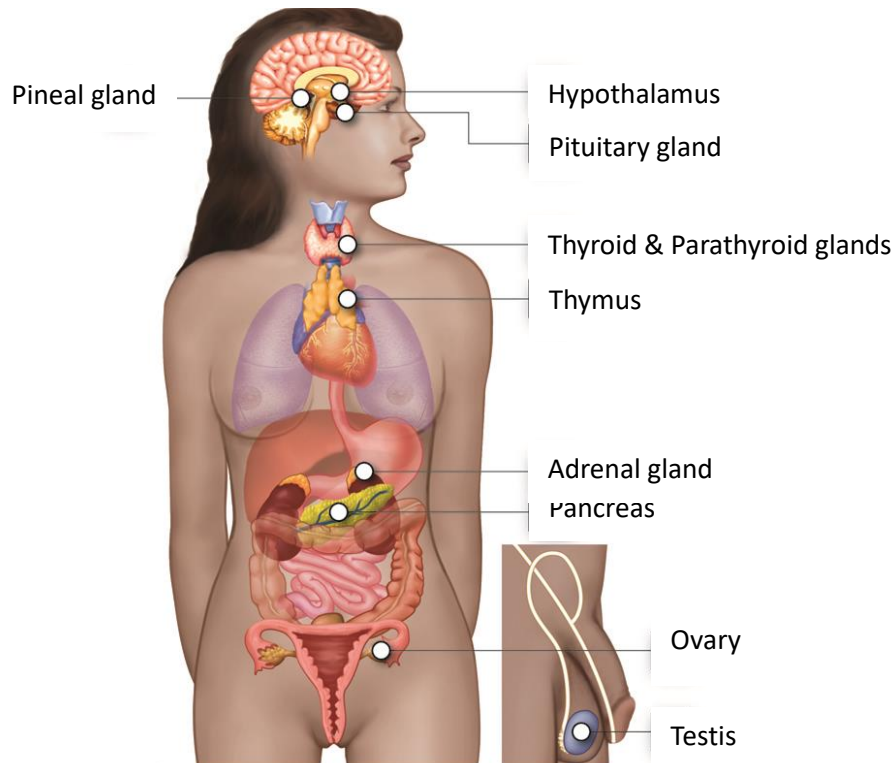
8.2.2 Endocrine glands

Only the main glands are covered here. Hormones are released by the glands whenever the body begins to move out of kilter, in order to re-establish order and keep the body safe. There are three main things that trigger the release of hormones from the glands:²

- a. A hormone released from another gland. For example, hormones from the pituitary gland (thyroid-stimulating hormone or TSH) may stimulate the thyroid to release hormones or (adrenocorticotrophic hormone or ACTH) may stimulate the adrenals.
- b. Changes in levels of nutrients and chemicals in the blood. For example, low calcium levels in the blood may trigger the parathyroid gland to release hormones which in turn release calcium from the bones.
- c. Direct nerve stimulation. For example, if you experience fear or stress, your nervous system will trigger the adrenal glands to release adrenalin to give you the energy to

² New Zealand College of Massage, Certificate in Massage The Nervous System and Endocrine System, p.33, 2001, self-published

run or fight.



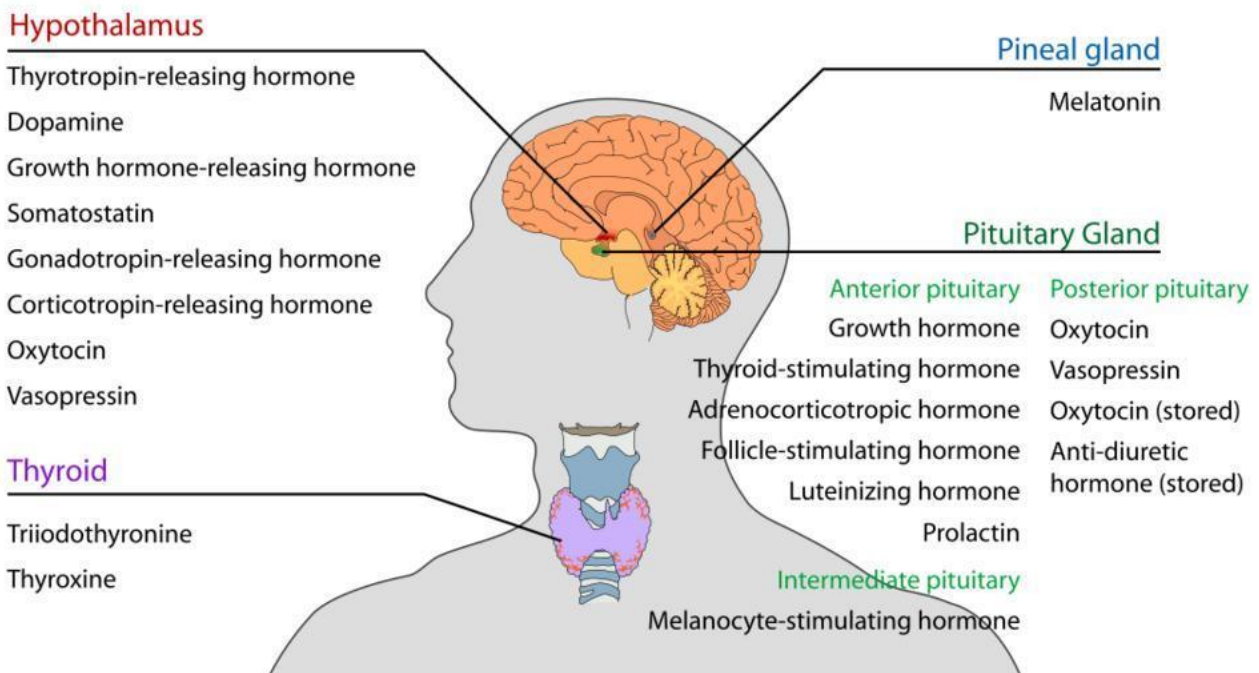
1. **Hypothalamus:**⁴ This is part of the nervous system and also the endocrine system. It monitors the state of the body (temperature, food intake, etc) and issues instructions to autonomic nervous system (e.g start sweating or start shivering) and to the pituitary gland to release hormones. It is small and part of the lower middle brain, and is situated near the pituitary gland.
2. **Pituitary Gland:** This is often considered to be the “master gland” because it releases at least nine different hormones, some of which control body functions directly and some of which trigger other glands to release hormones. It’s a bit like the conductor of an orchestra working to keep everything in tune. Its human growth hormone stimulates cell division and the growth of muscles and bones during childhood (resulting in dwarfism or gigantism if unbalanced) and it increases the blood glucose level. Its luteinizing hormone stimulates the monthly ovulation cycle in females and triggers the testes in men to produce male sex hormones. Oxytocin stimulates uterus muscle contraction during childbirth and the breasts to release milk when a baby feeds. Breastfeeding in turn stimulates the pituitary to release prolactin which stimulates milk production so that milk

³ Diagram by Cenvo, CC BY 3.0 US, <https://images.app.goo.gl/4BeRBpCRd3GDfp7s9>, with labels changed

⁴ The following descriptions of the endocrine glands summarised from New Zealand College of Massage, Certificate in Massage The Nervous System and Endocrine System, p.33-4, 2001, self-published and David Burnie, Concise Encyclopedia Human Body, Dorling Kindersley, 1998

is made for as long as the baby feeds. Despite all its power, the pituitary gland is only about the size of a pea, sitting at the base of the brain.

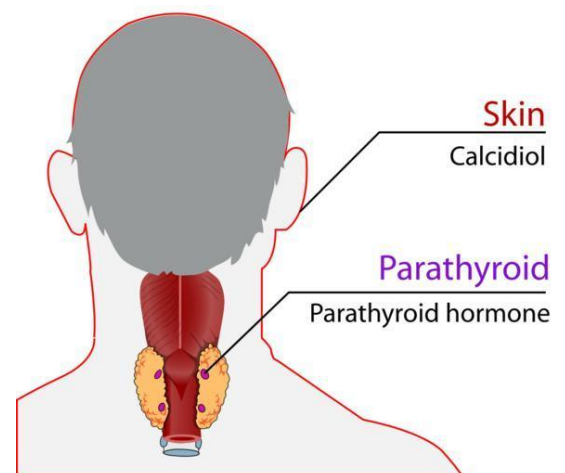
- 3. Pineal Gland:** Some aspects of this gland are still being understood. It produces melatonin, a hormone that is stimulated by the light and dark cycle of each day (and the seasons) and which regulates our sleep patterns. It is about the size of a grain of rice, shaped like a pine cone and is located deep in the brain.



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- 4. Thyroid Gland:** This gland controls our metabolic rate and the calcium levels in the body. The thyroxine hormone speeds up our metabolic rate (increasing cell division, improving the nervous system, increasing the heart rate and blood pressure). It contains iodine and, because that is deficient in our NZ foods, it has been added to our salt so the thyroid continues to function well. The calcitonin hormone slows the rate at which bone is broken down. This gland is located at the front of the neck, just below the voice box.

- 5. Parathyroid Glands:**⁶ These are four tiny glands in the neck that play a role in bone development. This gland also controls the calcium levels in the blood. The parathyroid hormone stimulates the release of calcium from the bones to ensure



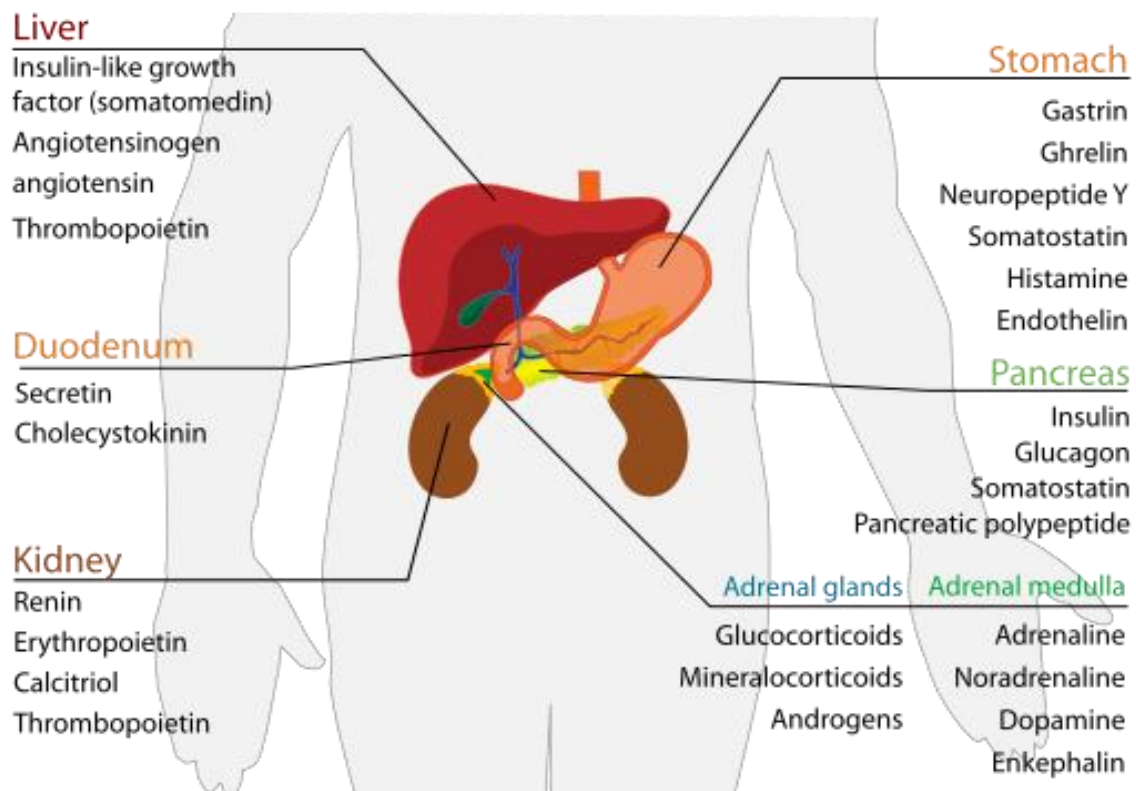
⁵ Diagram from LadyofHats, Public domain, via Wikimedia Commons

⁶ Diagram from LadyofHats, Public domain, via Wikimedia Commons

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calcium is always available for muscle contractions and blood clotting. They are four small pair glands on the back of and surrounded by the thyroid gland.

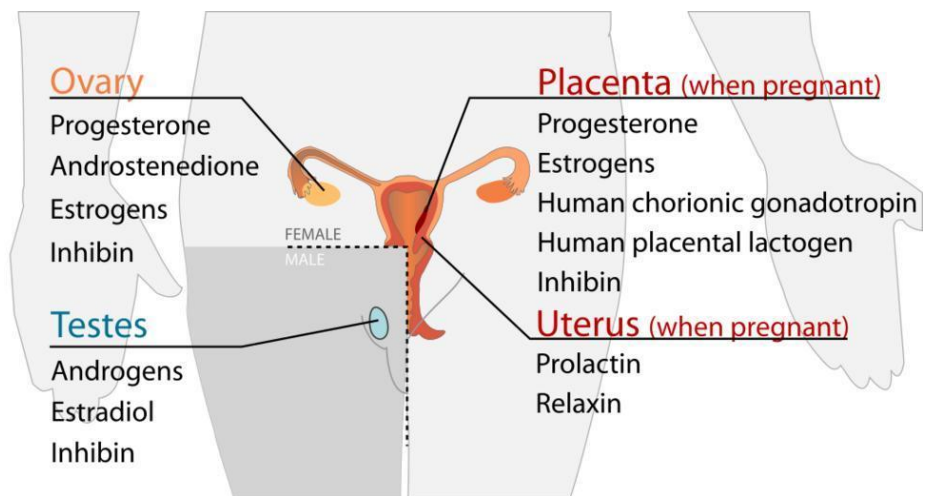
6. **Thymus Gland:** This is also part of our lymphatic system and it is a gland in the upper chest that helps develop the body's immune system early in life. As part of our lymphatic system it produces T cells to fight infections and as part of the endocrine system it produces thymosin hormones that encourage the T cells to mature. It lies above the heart under our breast bone (sternum) and is only active until puberty when it starts to shrink.
7. **Adrenal Glands:** The adrenal glands increase our metabolic rate and prepare our body for stress. They are divided into two parts: the outer cortex produces corticosteroids which help to control our metabolism; the inner medulla produces adrenalin which increases our heart rate, blood pressure and opens the airways to the lungs when we are alarmed or stressed. There are two adrenal glands, one sitting on the top of each kidney.
8. **Pancreas:** This organ is part of both the digestive and endocrine system and it's critical in maintaining blood sugar levels. It releases insulin when the blood sugar is too high so the cells and liver absorb it, and it releases glucagon when the blood sugar is too low so the cells and liver release the glucose and glycogen back again. It is a long slender organ that lies almost horizontally below the stomach.⁷



⁷ Diagram below from LadyofHats, Public domain, via Wikimedia Commons

9. Ovaries (in females):⁸

These are the female reproductive organs that release eggs and produce sex hormones. Like the pituitary gland, the ovaries and testes only produce sex hormones after the ages of about 10 or 11



years. Ovaries produce oestrogens which are responsible for physical changes such as breast growth and widening of the pelvis. Progesterone is produced in the ovaries by the corpus luteum and it stops ovulation during pregnancy and while lactating. Each ovary is about 3cm long and is connected to either side of the uterus via a Fallopian tube.

10. Testes (in males): These are male reproductive glands that produce sperm and sex hormones. The testes release testosterone which is responsible for physical changes in pubescent males such as the deepening of the voice and growth of facial hair, and it regulates the development of sperm. The testes are located on the outside of the body in the scrotum.

8.2.3 Endocrine dysfunctions

Because the endocrine system affects so many body functions, when it is compromised it can have many effects.

Endocrine disorders broadly fall into two categories:

- Diseases associated with a hormone imbalance caused by a gland producing too much or too little of a hormone.
- Diseases caused by lesions in the endocrine system. The presence of such nodules or tumours may or may not affect hormone levels.

Diabetes is one of the most common endocrine disorders diagnosed in the Western world (including pre-diabetes, type 1 diabetes, type 2 diabetes, gestational diabetes, hyperglycemia, hypoglycemia) but there is a long list of other diseases also influenced by the endocrine system including:

⁸ Diagram from LadyofHats, Public domain, via Wikimedia Commons

- adrenal disorders (Addison’s disease, adrenal cancer, Cushing’s syndrome, pheochromocytoma);
- growth disorders (acromegaly, growth hormone deficiency, Turner syndrome);
- heart disease (through type 2 diabetes and obesity),
- low testosterone;
- multiple endocrine neoplasia (MEN 1, MEN 2A, MEN 2B);
- menopause & perimenopause issues (period issues, sleep disturbance, hot flushes, sex issues, depression);
- metabolic syndrome;
- obesity;
- osteoporosis;
- parathyroid diseases (hyperparathyroidism, hypoparathyroidism, parathyroid cancer);
- pituitary disorders (acromegaly, Cushing’s syndrome, Parkinson’s disease, pituitary tumours);
- polycystic ovary syndrome;
- reproduction issues (infertility, miscarriage);
- thymus disorders (auto-immune problems, myasthenia gravis, thymus cancer);
- thyroid cancer (anaplastic thyroid cancer, follicular thyroid cancer, medullary thyroid cancer, papillary thyroid cancer, Hurthle cell thyroid cancer);
- other thyroid diseases (goiter, Graves’ disease, hyperthyroidism, hypothyroidism, thyroid nodules); and
- thyroiditis (De Quervain’s thyroiditis, Hashimoto’s thyroiditis, silent thyroiditis).⁹

8.2.4 Learning for spiritual healers

Because the endocrine glands can have such a major effect on a person’s health if they get out of balance, scanning and healing over the major glands (or their associated chakras – Chap 9-1) could be considered when doing any healing.

Healing the head area where the “master” pituitary gland resides should be a priority. It affects so many body functions and other glands. This is particularly relevant if the person appears stressed as it’s the pituitary that triggers the stress response in the adrenal glands. There will be little point in healing the adrenal glands if you haven’t first calmed the mind and the pituitary gland.

⁹ Based on list from www.endocrineweb.com/conditions and supplemented.

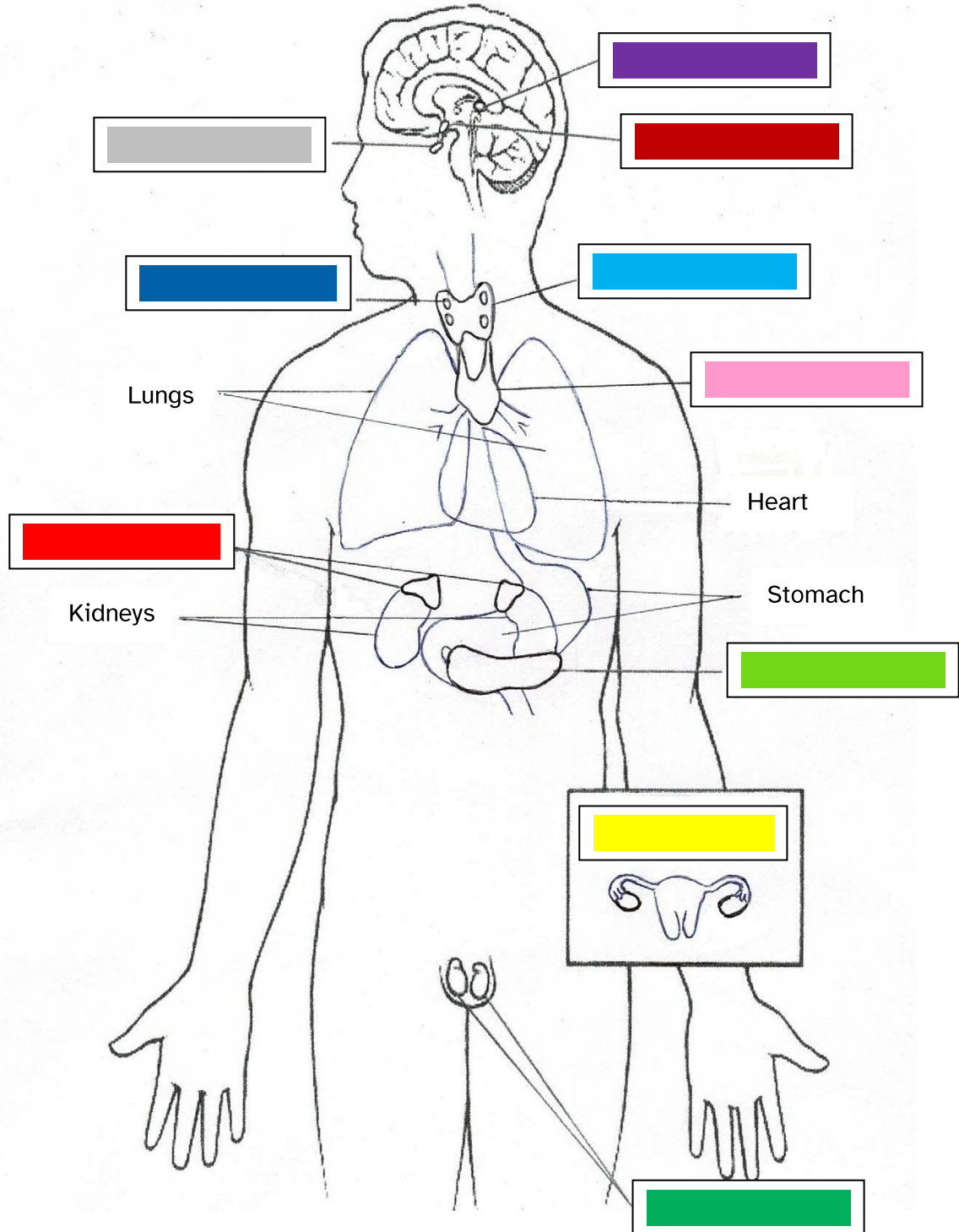
Individual Exercise 1

Complete the following table of endocrine glands and hormones.

Endocrine Gland	One Hormone Produced	Function of Hormone
	Human growth hormone	
Pineal gland		
		Increases the heart rate & opens the airways to the lungs
		Growth of breasts, widening of hips during female puberty; gives feminine characteristics.
Parathyroid gland		
	Calcitonin	
Thymus		
		Deepening of the voice and growth of facial hair in young males, regulates the development of sperm
	Insulin	

Individual Exercise 2

Using the information in this chapter to guide you, label and colour the endocrine glands on the following diagram¹⁰.



¹⁰ Adjusted diagram, original by Karen L. Lancour, Endocrine System -Training Handout, www.soinc.org/sites/default/files/uploaded_files/5-17_ENDOCRINE_HANDOUT.pdf, p.4, with labels blanked out, with information from Margaret Matt, Human Anatomy Coloring Book, 1982, Dover Publications p.40