Summary Article: **Body Systems**  
From *The Human Body Book: An Illustrated Guide to Its Structure, Function and Disorders*

The human body's systems work together as a true cooperative – each one fulfils its own vital function, but all work together to maintain health and efficiency.

Just like every other living thing, the prime biological aim of the human body is to replace itself with viable offspring. However, it is far from being simply a gene-carrier, a reproductive system with extra supporting parts “added on”. In fact, and somewhat ironically, the reproductive system is the only one that is not required for basic survival. The exact number and extent of the body’s systems is debated – the muscles, bones, and joints are sometimes combined as the musculoskeletal system, for instance. Although these systems can be described as separate entities, each depends on all others for physical and physiological support. Most systems have some “general” body tissues such as the connective tissues which delineate, support, and cushion many organs.

**Skeletal**

Explored in the section on Skeletal System

The skeleton is a solid, moveable framework that supports the body. Its bones work as levers and anchor plates to allow for movement. Bones also work for other body systems – blood cells develop in their fatty inner tissue (red marrow), for example. The body draws from mineral stores in bones during times of shortage, such as when calcium is needed for healthy nerve function.

**Components**

- Skull, spine, ribs, and breast bone (axial skeleton)
- Limb bones, shoulders, and hips (appendicular skeleton)
- Ligaments

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Muscular

Explored in the section on Muscular System

Muscles work with the skeleton, providing the pulling force for movement, from powerful to intricate. Involuntary muscles work largely automatically to control internal processes, such as blood distribution and digestion. Muscles rely on nerves to control them and blood to supply them with oxygen and energy.

**Components**

- Skeletal muscles (attached to bones)
- Smooth muscle within organs
- Tendons
- Cardiac muscle of heart

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Nervous

Explored in the section on Nervous System

The brain is the seat of both consciousness and creativity and, through the spinal cord and nerve branches, it controls all body movements with its motor output. The brain also receives sensory information from outside the body and within. Yet much of the brain's second-by-second activity is carried out unconsciously as it works with endocrine glands to monitor and maintain other body systems.

Components

Brain
Spinal cord
Peripheral nerves
Sense organs

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Endocrine
Explored in the section on Endocrine System

The glands and cells of the endocrine system produce chemical messengers called hormones, which circulate in blood and other fluids. In response to physiological feedback, they maintain an optimal internal environment. Hormones also govern long-term processes such as growth, the changes that take place during puberty, and reproductive activity. The endocrine system is linked closely to the nervous system via the brain, allowing for dual monitoring and control of all other systems.

Components
Pituitary gland
Hypothalamus
Thyroid gland
Thymus gland
Heart
Stomach
Pancreas
Intestines
Adrenal glands
Ovaries (in female)
Testes (in male)

Cardiovascular
Explored in the section on Cardiovascular System

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The most basic function of the cardiovascular, or circulatory, system is to pump blood around the body. It supplies all organs and tissues with freshly oxygenated, nutrient-rich blood. Any waste products are removed with the blood as it leaves. The circulatory system also transports other vital substances, such as nutrients, hormones, and immune cells.

Components
- Heart
- Blood
- Major vessels (arteries and veins)
- Minor vessels (arterioles and venules)
- Microscopic vessels (capillaries)

Respiratory
Explored in the section on Respiratory System

The respiratory tract and its movements, powered by breathing muscles, carries air into and out of the lungs. Deep in the lungs gases are exchanged – vital oxygen is absorbed from the air and carbon dioxide is passed into it before the air is carried back out of the body. A secondary function of this system is vocalization.

Components
- Nasal and other air passages in the skull

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Skin, hair, and nails

Explored in the section on Skin, Hair, and Nails

The skin, hair, and nails form the body's outer protective covering, and are together termed the integumentary system. They repel physical damage and hazards such as micro-organisms and radiation. The skin also regulates body temperature by sweating when too hot. The layer of subcutaneous fat under the skin acts as an insulator, an energy store, and a physical shock absorber.

Components

- Skin
- Hair
- Nails
- Subcutaneous fat layer

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Lymphatic and immune

Explored in the section on Lymph and Immunity

The immune system's intricate interrelationships of physical, cellular, and chemical defences provide vital resistance to many threats, including infectious diseases and malfunctions of internal processes. The slowly circulating lymph fluid helps to distribute nutrients and collect waste. It also delivers immunity-providing white blood cells when needed.

**Components**

- White blood cells (such as lymphocytes)
- Antibodies
- Spleen
- Tonsils and adenoids
- Thymus gland
- Lymph fluid
- Lymph vessels, nodes (“glands”), and ducts

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Digestive
Explored in the section on Digestive System

The digestive tract’s nine metres or so of tubing, which varies in size between the mouth and the anus, has a complex range of functions. It chops and chews food, stores and then digests it, eliminates waste products, and passes the nutrients to the major gland, the liver, which makes optimal use of the various digestive products. Healthy digestion depends on the proper functioning of the immune and nervous systems, and psychological state also greatly affects digestion.

Components
- Mouth and throat (pharynx)
- Oesophagus
- Stomach
- Pancreas
- Liver
- Gallbladder
- Small intestine (duodenum, jejunum, and ileum)
- Large intestine (colon, appendix, and rectum)
- Anus
The formation of urine by the kidneys eliminates wastes and excess substances from the blood, helping to maintain the body’s correct balance of water, fluids, salts, and minerals. Urine production is controlled by several hormones and is influenced by blood flow and pressure, the quantities of incoming water and nutrients, fluid loss (through sweating and bleeding, for instance), external conditions (especially temperature), and regular bodily cycles (such as sleeping and waking).

**Components**
- Kidneys
- Ureters
- Bladder
- Urethra
Male

Reproductive
Explored in the section on Reproduction and Life Cycle

Unlike any other system, the reproductive system differs dramatically between female and male, it functions only for part of the human life span, and it can be surgically removed without threatening life.

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The production of sperm in the male is continual while the female production of ripe eggs is cyclical. In the male, both sperm and urine use the urethra as an exit tube at different times.

**Components**

**Female:**
- Ovaries, fallopian tubes, and uterus
- Vagina and external genitalia
- Breasts

**Male:**
- Testes, spermatic ducts, seminal vesicles, urethra, and penis
- Prostate and bulbourethral glands
Male