## Introduction to the human body

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The human body is rather like a highly technical and sophisticated machine. It operates as a single entity, but is made up of a number of systems that work interdependently. Each system is associated with a specific, and sometimes related, function that is normally essential for the well-being of the individual. Should one system fail, the consequences can extend to others, and may reduce the ability of the body to function normally. Integrated working of the body systems ensures survival. The human body is therefore complex in both structure and function, and this book aims to explain the fundamental structures and processes involved.

Anatomy is the study of the structure of the body and the physical relationships between body systems. Physiology is the study of how the body systems work, and the ways in which their integrated activities maintain life and health of the individual. Pathology is the study of abnormalities and how they affect body functions, often causing illness. The final section of this chapter provides a framework for studying diseases, an outline of mechanisms that cause disease and some common disease processes. Building on the normal anatomy and physiology, relevant illnesses are considered at the end of the later chapters.

**Levels of structural complexity**

**Learning outcome**

After studying this section you should be able to:

- describe the levels of structural complexity within the body.

Within the body are different levels of structural organisation and complexity. The most fundamental level is chemical. Atoms combine to form molecules, of which there are a vast range in the body. The structures, properties and functions of important biological molecules are considered in Chapter 2. Cells are the smallest independent units of living matter and there are trillions of them within the body. They are too small to be seen with the naked eye, but when magnified using a microscope different types can be distinguished by their size, shape and the dyes they absorb when stained in the laboratory. Each cell type has become specialised, and carries out a particular function that contributes to body needs. Figure 1.1 shows some highly magnified nerve cells. In complex organisms such as the human body, cells with similar structures and functions are found together, forming tissues. The structure and functions of cells and tissues are explored in Chapter 3.

**The internal environment and homeostasis**

**Learning outcomes**

After studying this section you should be able to:

- define the terms internal environment and homeostasis
- compare and contrast negative and positive feedback control mechanisms
- outline the potential consequences of homeostatic imbalance.

Organ systems are made up of a number of different types of tissue and have evolved to carry out a specific function. Figure 1.2 shows that the stomach is lined by a layer of epithelial tissue and that its wall contains layers of smooth muscle tissue. Both tissues contribute to the functions of the stomach, but in different ways.

Systems consist of a number of organs and tissues that together contribute to one or more survival needs of the body. For example the stomach is one of several organs of the digestive system, which has its own specific function. The human body has several systems, which work interdependently carrying out specific functions. All are required for health. The structure and functions of body systems are considered in later chapters.
The external environment surrounds the body and is the source of oxygen and nutrients required by all body cells. Waste products of cellular activity are eventually excreted into the external environment. The skin provides a barrier between the dry external environment (the atmosphere) and the aqueous (water-based) environment of most body cells.

The internal environment is the water-based medium in which body cells exist. Cells are bathed in fluid called interstitial or tissue fluid. Oxygen and other substances they require must travel from the internal transport systems through the interstitial fluid to reach them. Similarly, cellular waste products must move through the interstitial fluid and transport systems to the excretory organs to be excreted.

Each cell is enclosed by its plasma membrane, which provides a potential barrier to substances entering or leaving. The structure of membranes (p. 28) confers certain properties, in particular selective permeability or semipermeability. This controls the movement of molecules into and out of the cell, and allows the cell to regulate its internal composition (Fig. 1.3). Smaller particles can usually pass through the membrane, some much more readily than others, and therefore the chemical composition of the fluid inside is different from that outside the cell.

**Homeostasis**

The composition of the internal environment is tightly controlled, and this fairly constant state is called
**Homeostasis**. Literally, this term means ‘unchanging’, but in practice it describes a dynamic, ever-changing situation kept within narrow limits. When this balance is threatened or lost, there is a serious risk to the well-being of the individual. Box 1.1 lists some important physiological variables maintained within narrow limits by homeostatic control mechanisms.

Homeostasis is maintained by control systems that detect and respond to changes in the internal environment. A control system (Fig. 1.4) has three basic components: detector, control centre and effector. The control centre determines the limits within which the variable factor should be maintained. It receives an input from the detector, or sensor, and integrates the incoming information. When the incoming signal indicates that an adjustment is needed, the control centre responds and its output to the effector is changed. This is a dynamic process that allows constant readjustment of many physiological variables.

**Negative feedback mechanisms**

In systems controlled by negative feedback, the effector response decreases or negates the effect of the original stimulus, maintaining or restoring homeostasis (thus the term negative feedback). Control of body temperature is similar to the non-physiological example of a domestic central heating system. The thermostat (temperature detector) is sensitive to changes in room temperature (variable factor). The thermostat is connected to the boiler control unit (control centre), which controls the boiler (effector). The thermostat constantly compares the information from the detector with the preset temperature and, when necessary, adjustments are made to alter the room temperature. When the thermostat detects the room temperature is low, it switches the boiler on. The result is output of heat by the boiler, warming the room. When the preset temperature is reached, the system is reversed. The thermostat detects the higher room temperature and turns the boiler off. Heat production from the boiler stops and the room slowly cools as heat is lost. This series of events is a negative feedback mechanism and it enables continuous self-regulation, or control, of a variable factor within a narrow range.

Body temperature is a physiological variable controlled by negative feedback (Fig. 1.5), which prevents problems due to it becoming too high or too low. When body temperature falls below the preset level, this is detected by specialised temperature sensitive nerve endings in the hypothalamus of the brain, which form the control centre. This centre then activates mechanisms that raise body temperature (effectors). These include:

- stimulation of skeletal muscles causing shivering
- narrowing of the blood vessels in the skin reducing the blood flow to, and heat loss from, the peripheries
- behavioural changes, e.g. we put on more clothes or curl up.
When body temperature rises within the normal range again, the temperature sensitive nerve endings are no longer stimulated, and their signals to the hypothalamus stop. Therefore, shivering stops and blood flow to the peripheries returns to normal.

Most of the homeostatic controls in the body use negative feedback mechanisms to prevent sudden and serious changes in the internal environment. Many more of these are explained in the following chapters.

Positive feedback mechanisms

There are only a few of these cascade or amplifier systems in the body. In positive feedback mechanisms, the stimulus progressively increases the response, so that as long as the stimulus is continued the response is progressively amplified. Examples include blood clotting and uterine contractions during labour.

During labour, contractions of the uterus are stimulated by the hormone oxytocin. These force the baby’s head into the cervix of the uterus, stimulating stretch receptors there. In response to this, more oxytocin is released, further strengthening the contractions and maintaining labour. After the baby is born the stimulus (stretching of the cervix) is no longer present so the release of oxytocin stops (see Fig. 9.5, p. 212).

Homeostatic imbalance

This arises when the fine control of a factor in the internal environment is inadequate and the level of the factor falls outside the normal range. If the control system cannot maintain homeostasis, an abnormal state develops that may threaten health, or even life. Many such situations, including effects of abnormalities of the variable factors in Box 1.1, are explained in later chapters.

Survival needs of the body

Learning outcomes

After studying this section you should be able to:

- describe the roles of the body transport systems
- outline the roles of the nervous and endocrine systems in internal communication
- outline how raw materials are absorbed by the body
- state the waste materials eliminated from the body
- outline activities undertaken for protection and survival.

By convention, body systems are described separately in the study of anatomy and physiology, but in reality they work interdependently. This section provides an introduction to body activities, linking them to survival needs (Table 1.1). The later chapters build on this framework, exploring human structure and functions in health and illness using a systems approach.

Communication

In this section, transport and communication are considered. Transport systems ensure that all cells have access to the internal and external environments; the blood, the circulatory system and lymphatic system are involved.

All communication systems involve receiving, collating and responding to appropriate information. There are different systems for communicating with the internal and external environments. Internal communication involves mainly the nervous and endocrine systems; these are important in the maintenance of homeostasis and regulation of vital body functions. Communication with the external environment involves the special senses, and verbal and non-verbal activities, and all of these also depend on the nervous system.
Transport systems

Blood (Ch. 4)

The blood transports substances around the body through a large network of blood vessels. In adults the body contains 5 to 6 litres of blood. It consists of two parts – a fluid called plasma and blood cells suspended in the plasma.

**Plasma.** This is mainly water with a wide range of substances dissolved or suspended in it. These include:

- nutrients absorbed from the alimentary canal
- oxygen absorbed from the lungs
- chemical substances synthesised by body cells, e.g., hormones
- waste materials produced by all cells to be eliminated from the body by excretion.

**Blood cells.** There are three distinct groups, classified according to their functions (Fig. 1.6).

- *Erythrocytes* (red blood cells) transport oxygen and, to a lesser extent, carbon dioxide between the lungs and all body cells.
- *Leukocytes* (white blood cells) are mainly concerned with protection of the body against infection and foreign substances. There are several types of leukocytes, which carry out their protective functions in different ways. These cells are larger and less numerous than erythrocytes.
- *Platelets* (thrombocytes) are tiny cell fragments that play an essential part in blood clotting.

Circulatory system (Ch. 5)

This consists of a network of blood vessels and the heart (Fig. 1.7).

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**Blood vessels.** There are three types:

- *arteries*, which carry blood away from the heart
- *veins*, which return blood to the heart
- *capillaries*, which link the arteries and veins.

Capillaries are tiny blood vessels with very thin walls consisting of only one layer of cells. They are the site of exchange of substances between the blood and body tissues, e.g., nutrients, oxygen and cellular waste products. Blood vessels form a network that transports blood to:

**Table 1.1 Survival needs and related body activities**

- **Communication**  
  - Transport systems: blood, circulatory system, lymphatic system  
  - Internal communication: nervous system, endocrine system  
  - External communication: special senses, verbal and non-verbal communication

- **Intake of raw materials and elimination of waste**  
  - Intake of oxygen  
  - Ingestion of nutrients (eating)  
  - Elimination of wastes: carbon dioxide, urine, faeces

- **Protection and survival**  
  - Protection against the external environment: skin  
  - Protection against microbial infection: resistance and immunity  
  - Body movement  
  - Survival of the species: reproduction and transmission of inherited characteristics

**Figure 1.6 Coloured scanning electron micrograph of blood showing red blood cells, white blood cells (yellow) and platelets (pink).**

**Figure 1.7 The circulatory system.**
• the lungs (pulmonary circulation) where oxygen is absorbed from the air in the lungs and, at the same time, carbon dioxide is excreted from the blood into the air
• cells in all other parts of the body (general or systemic circulation).

Heart. The heart is a muscular sac, which pumps blood round the body and maintains the blood pressure.

The heart muscle is not under conscious (voluntary) control. At rest, the heart contracts, or beats, between 65 and 75 times per minute. The rate is greatly increased during exercise, when body oxygen requirements are increased.

The rate at which the heart beats can be counted by taking the pulse. The pulse can be felt most easily where a superficial artery can be pressed gently against a bone. The wrist is the site most commonly used for this purpose.

Lymphatic system (Ch. 6)
The lymphatic system (Fig. 1.8) consists of a series of lymph vessels, which begin as blind-ended tubes in the spaces between the blood capillaries and tissue cells. Structurally they are similar to veins and blood capillaries but the pores in the walls of the lymph capillaries are larger than those of the blood capillaries. Lymph is tissue fluid that also contains material drained from tissue spaces, including plasma proteins and, sometimes, bacteria or cell debris. It is transported along lymph vessels and returned to the bloodstream.

There are collections of lymph nodes situated at various points along the length of the lymph vessels. Lymph is filtered as it passes through the lymph nodes, and microbes and other materials are removed.

The lymphatic system (Ch. 6) also provides the sites for formation and maturation of lymphocytes, the white blood cells involved in immunity (Ch. 15).

Internal communication
This is carried out through the activities of the nervous and endocrine systems.

Nervous system (Ch. 7)
The nervous system is a rapid communication system. The main components are shown in Figure 1.9.

The central nervous system consists of:
• the brain, situated inside the skull
• the spinal cord, which extends from the base of the skull to the lumbar region and is protected from injury by the bones of the spinal column.

The peripheral nervous system is a network of nerve fibres, which are:
• sensory or afferent nerves that transmit signals from the body to the brain, or
• motor or efferent nerves, which transmit signals from the brain to the effector organs, such as muscles and glands.

The somatic (common) senses are pain, touch, heat and cold, and they arise following stimulation of specialised sensory receptors at nerve endings found throughout the skin.

There are different receptors in muscles and joints that respond to changes in the position and orientation of the body, maintaining posture and balance. Yet other receptors are activated by stimuli in internal organs and control vital body functions, e.g. heart rate, respiratory rate and blood pressure. Stimulation of any of these receptors...
sets up impulses that are conducted to the brain in sensory (afferent) nerves.

Communication along nerve fibres (cells) is by electrical impulses that are generated when nerve endings are stimulated. Nerve signals travel at great speed, so response to a nerve signal is almost immediate, making rapid and fine adjustments to body functions possible.

Communication between nerve cells is also required, since more than one nerve is involved in the chain of events occurring between the initial stimulus and the reaction to it. Nerves communicate with each other by releasing a chemical (the neurotransmitter) into tiny gaps between them. The neurotransmitter quickly travels across the gap and either stimulates or inhibits the next nerve cell, thus ensuring the message is transmitted.

Sensory nerves send signals from the body to the appropriate parts of the brain, where the incoming information is analysed and collated. The brain responds by sending signals along motor (efferent) nerves to the appropriate effector organ(s). In this way, many aspects of body function are continuously monitored and adjusted, usually by negative feedback control, and usually without conscious awareness, e.g. regulation of blood pressure.

Reflex actions are fast, involuntary, and usually protective motor responses to specific stimuli. They include:
- withdrawal of a finger from a very hot surface
- constriction of the pupil in response to bright light
- control of blood pressure.

Endocrine system (Ch. 9)
The endocrine system consists of a number of discrete glands situated in different parts of the body. They synthesise and secrete chemical messengers called hormones that circulate round the body in the blood. Hormones stimulate target glands or tissues, influencing metabolic and other cellular activities and regulating body growth and maturation. Endocrine glands detect and respond to levels of particular substances in the blood, including specific hormones. Changes in blood hormone levels are usually controlled by negative feedback mechanisms (see Fig. 1.4). The endocrine system provides slower and more precise control of body functions than the nervous system.

Communication with the external environment

Special senses (Ch. 8)
These senses arise following stimulation of specialised sensory receptor cells located in sensory organs or tissues in the head. The senses and the special organs involved are shown in Box 1.2.

Although these senses are usually considered to be separate and different from each other, one sense is rarely used alone (Fig. 1.10). For example, when the smell of smoke is perceived then other senses such as sight and sound are used to try and locate the source of a fire. Similarly, taste and smell are closely associated in the enjoyment, or otherwise, of food. The brain collates incoming information with information from the memory and initiates a response by setting up electrical impulses in motor (efferent) nerves to effector organs, muscles and glands. Such responses enable the individual to escape from the fire, or to prepare the digestive system for eating.

Verbal communication
Sound is a means of communication that is produced in the larynx as a result of blowing air through the space between the vocal cords (see Fig. 10.8) during expiration. Speech produces recognisable sounds by co-ordinated contraction of the muscles of the throat and cheeks, and movements of the tongue and lower jaw.

Non-verbal communication
Posture and movements are often associated with non-verbal communication, e.g. nodding the head and shrugging the shoulders. The skeleton provides the bony framework of the body (Ch. 16), and movement takes place at joints between bones. Skeletal muscles move the skeleton and attach bones to one another, spanning one or more joints in between. They are stimulated by the part of the nervous system under voluntary (conscious) control. Some non-verbal communication, e.g. changes in facial expression, may not involve the movement of bones.
Intake of raw materials and elimination of waste

This section considers substances taken into and excreted from the body. Oxygen, water and food are taken in, and carbon dioxide, urine and faeces are excreted.

Intake of oxygen

Oxygen gas makes up about 21% of atmospheric air. A continuous supply is essential for human life because it is needed for most chemical activities that take place in the body cells. Oxygen is necessary for the series of chemical reactions that result in the release of energy from nutrients.

The upper respiratory system carries air between the nose and the lungs during breathing (Ch. 10). Air passes through a system of passages consisting of the pharynx (also part of the digestive tract), the larynx (voice box), the trachea, two bronchi (one bronchus to each lung) and a large number of bronchial passages (Fig. 1.11). These end in alveoli, millions of tiny air sacs in each lung. They are surrounded by a network of tiny capillaries and are the sites where vital gas exchange between the lungs and the blood takes place (Fig. 1.12).

Nitrogen, which makes up about 80% of atmospheric air, is breathed in and out, but it cannot be used by the body in gaseous form. The nitrogen needed by the body is obtained by eating protein-containing foods, mainly meat and fish.

Ingestion of nutrients (eating)

Nutrition is considered in Chapter 11. A balanced diet is important for health and provides nutrients, substances that are absorbed, usually following digestion, and promote body function. Nutrients include water, carbohydrates, proteins, fats, vitamins and mineral salts. They serve vital functions including:

- maintenance of water balance within the body
- energy production, mainly carbohydrates and fats
- synthesis of large and complex molecules, using mineral salts, proteins, fats, carbohydrates and vitamins
- cell building, growth and repair, especially proteins.

Digestion

The digestive system evolved because food is chemically complex and seldom in a form body cells can use. Its function is to break down, or digest, food so that it can be absorbed into the circulation and then used by body cells. The digestive system consists of the alimentary canal and accessory glands (Fig. 1.13).

Alimentary canal. This is essentially a tube that begins at the mouth and continues through the pharynx, oesophagus, stomach, small and large intestines, rectum and anus.
Glands. The accessory organs situated outside the alimentary canal with ducts leading into it are the salivary glands, the pancreas and the liver. There are also many tiny glands situated in the walls of the alimentary canal. Most of these glands synthesise digestive enzymes that are involved in the chemical breakdown of food. Some others secrete mucus that provides lubrication.

Metabolism
This is the sum total of the chemical activity in the body. It consists of two groups of processes:

- **anabolism**, building or synthesising large and complex substances
- **catabolism**, breaking down substances to provide energy and raw materials for anabolism, and substances for excretion as waste.

The sources of energy are mainly the carbohydrates and fats provided by the diet. If these are in short supply, proteins are used.

Elimination of wastes
Carbon dioxide
This is a waste product of cellular metabolism. Because it dissolves in body fluids to make an acid solution, it must be excreted in appropriate amounts to maintain pH (acidity or alkalinity) within the normal range. The main route of carbon dioxide excretion is through the lungs during expiration.

Urine
This is formed by the kidneys, which are part of the urinary system (Ch. 13). The organs of the urinary system are shown in Figure 1.14. Urine consists of water and waste products mainly of protein breakdown, e.g. urea. Under the influence of hormones from the endocrine system, the kidneys regulate water balance. They also play a role in maintaining blood pH within the normal range. The bladder stores urine until it is excreted during micturition.

Faeces
The waste materials from the digestive system are excreted as faeces during defaecation. They contain:

- indigestible food residue that remains in the alimentary canal because it cannot be absorbed
- bile from the liver, which contains the waste products from the breakdown of red blood cells
- large numbers of microbes.

Protection and survival
In this section relevant activities are outlined under the following headings: protection against the external environment, protection against infection, movement and survival of the species.

Protection against the external environment
The skin (Fig. 1.15) forms a barrier against invasion by microbes, chemicals and dehydration (Ch. 14). It consists of two layers: the epidermis and the dermis.

The epidermis lies superficially and is composed of several layers of cells that grow towards the surface from its deepest layer. The surface layer consists of dead cells that are constantly being rubbed off and replaced from below. The epidermis constitutes the barrier between the moist internal environment and the dry atmosphere of the external environment.
The *dermis* contains tiny sweat glands that have little canals or ducts, leading to the surface. Hairs grow from follicles in the dermis. The dermis is rich in sensory nerve endings sensitive to pain, temperature and touch. It is a vast organ that constantly provides the central nervous system with sensory input from the body surfaces. The skin also plays an important role in regulation of body temperature.

**Protection against infection**

The body has many means of self-protection from invaders, which confer resistance and/or immunity (Ch. 15). They are divided into two categories: specific and non-specific defence mechanisms.

**Non-specific defence mechanisms**

These are effective against any invaders. The protection provided by the skin is outlined above. In addition there are other protective features at body surfaces, e.g. *mucus* secreted by mucous membranes traps microbes and other foreign materials on its sticky surface. Some body fluids contain *antimicrobial substances*, e.g. gastric juice contains hydrochloric acid, which kills most ingested microbes. Following successful invasion other non-specific processes that counteract potentially harmful consequences may occur, including the inflammatory response.

**Specific defence mechanisms**

The body generates a specific (immune) response against any substance it identifies as foreign. Such substances are called *antigens* and include:

- bacteria and other microbes
- cancer cells or transplanted tissue cells
- pollen from flowers and plants.

Following exposure to an antigen, lifelong immunity against further invasion by the same antigen often develops. Over a lifetime, an individual gradually builds up immunity to millions of antigens. Allergic reactions are abnormally powerful immune responses to an antigen that usually poses no threat to the body.

**Movement**

Movement of the whole body, or parts of it, is essential for many body activities, e.g. obtaining food, avoiding injury and reproduction.

Most body movement is under conscious (voluntary) control. Exceptions include protective movements that are carried out before the individual is aware of them, e.g. the reflex action of removing the finger from a very hot surface.

The musculoskeletal system includes the bones of the skeleton, *skeletal muscles* and *joints*. The skeleton provides the rigid body framework and movement takes place at joints between two or more bones. Skeletal muscles (Fig. 1.16), under the control of the voluntary nervous system, maintain posture and balance, and move the skeleton. A brief description of the skeleton is given in Chapter 3, and a more detailed account of bones, muscles and joints is presented in Chapter 16.

**Survival of the species**

Survival of a species is essential to prevent its extinction. This requires the transmission of inherited characteristics to a new generation by reproduction.

**Transmission of inherited characteristics**

Individuals with the most advantageous genetic make-up are most likely to survive, reproduce and pass their genes on to the next generation. This is the basis of natural selection, i.e. ‘survival of the fittest’. Chapter 17 explores the transmission of inherited characteristics.

**Reproduction (Ch. 18)**

Successful reproduction is essential in order to ensure the continuation of a species and its genetic characteristics from one generation to the next. Fertilisation (Fig. 1.17) occurs when a female egg cell or *ovum* fuses with a male sperm cell or *spermatozoon*. Ova are produced by two *ovaries* situated in the female pelvis (Fig. 1.18). Usually only one ovum is released at a time and it travels towards the *uterus* in the *uterine tube*. Spermatozoa are produced in large numbers by the two *testes*, situated in the *scrotum*. From each testis, spermatozoa pass through the *deferent duct* (vas deferens) to the *urethra*. During sexual intercourse (coitus) the spermatozoa are deposited in the *vagina*. 
They then swim upwards through the uterus and fertilise the ovum in the uterine tube. The fertilised ovum (zygote) then passes into the uterus, embeds itself in the uterine wall and grows to maturity during pregnancy or gestation, in about 40 weeks.

When the ovum is not fertilised it is expelled from the uterus accompanied by menstrual bleeding, known as menstruation. In females, the reproductive cycle consists of phases associated with changes in hormone levels involving the endocrine system.

A cycle takes around 28 days and they take place continuously between puberty and the menopause, except during pregnancy. At ovulation (Fig. 18.8) an ovum is released from one of the ovaries mid-cycle. There is no such cycle in the male but hormones, similar to those of the female, are involved in the production and maturation of spermatozoa.

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**Introduction to the study of illness**

**Learning outcomes**

After studying this section you should be able to:

- list mechanisms that commonly cause disease
- define the terms aetiology, pathogenesis and prognosis
- name some common disease processes.

In order to understand the specific diseases described in later chapters, knowledge of the relevant anatomy and physiology is necessary, as well as familiarity with the pathological processes outlined below.

There are many different illnesses, disorders and diseases, which vary from minor, but often very troublesome conditions, to the very serious. The study of abnormalities can be made much easier when a systematic approach is adopted. In order to achieve this in later chapters where specific diseases are explained, the headings shown in Box 1.3 will be used as a guide. Causes (aetiology) are outlined first when there are clear links between them and the effects of the abnormality (pathogenesis).

**Box 1.3 Suggested framework for understanding diseases**

- Aetiology: cause of the disease
- Pathogenesis: the nature of the disease process and its effect on normal body functioning
- Complications: other consequences which might arise if the disease progresses
- Prognosis: the likely outcome
Aetiology

Diseases are usually caused by one or more of a limited number of mechanisms that may include:

- genetic abnormalities, either inherited or acquired
- infection by micro-organisms, e.g. bacteria, viruses, microbes or parasites, e.g. worms
- chemicals
- ionising radiation
- physical trauma
- degeneration, e.g. excessive use or ageing.

In some diseases more than one of the aetiological factors listed above is involved, while in others, no specific cause has been identified and these may be described as essential, idiopathic or spontaneous. Although the precise cause of a disease may not be known, predisposing (risk) factors are usually identifiable.

Iatrogenic conditions are those that result from healthcare interventions.

Pathogenesis

The main processes causing illness or disease are outlined below. Box 1.4 contains a glossary of disease-associated terminology.

**Inflammation** (p. 367) – this is a tissue response to any kind of tissue damage such as trauma or infection. Inflammatory conditions are recognised by the suffix -itis, e.g. appendicitis.

**Tumours** (p. 49) – these arise when abnormal cells escape body surveillance and proliferate. The rate of their production exceeds that of normal cell death causing a mass to develop. Tumours are recognised by the suffix -oma, e.g. carcinoma.

**Abnormal immune mechanisms** (p. 374) – these are responses of the normally protective immune system that cause undesirable effects.

**Thrombosis, embolism and infarction** (p. 111) – these are the effects and consequences of abnormal changes in the blood and/or blood vessel walls.

**Degeneration** – this is often associated with normal ageing but may also arise prematurely when structures deteriorate causing impaired function.

**Metabolic abnormalities** – these cause undesirable metabolic effects, e.g. diabetes mellitus, page 227.

**Genetic abnormalities** – these may be either inherited (e.g. phenylketonuria, p. 435) or caused by environmental factors such as exposure to ionising radiation (p. 49).

For a range of self-assessment exercises on the topics in this chapter, visit www.rossandwilson.com.