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HOW THE DOG WORKS

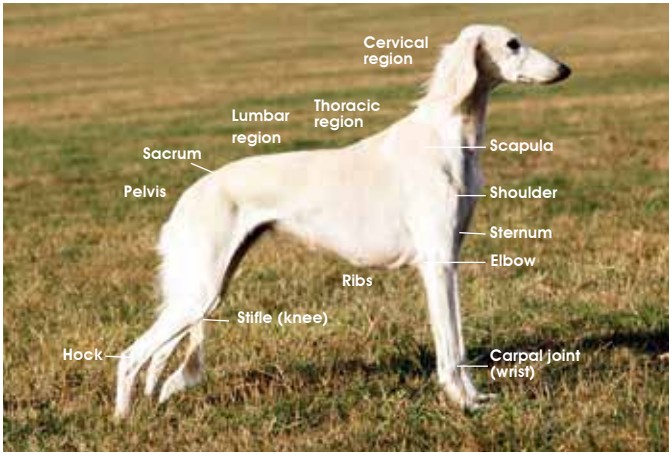
The body of a dog, like the bodies of most other animals, is a complex, living machine. And as explained in the Introduction, the body relies on all its different systems operating in harmony to ensure proper function and good health.

Massage is an effective method of helping to repair parts of the body 'machine' when it is faltering, but to maximize the benefit of the massage treatment you are applying, it's essential to understand a little of how the body of a dog works in biological terms. This can assist in not only determining the nature of a specific problem, but also – more importantly – help you understand how the massage you are applying will affect the canine patient.

A body in balance

Just like our own systems, those of your dog are finely balanced. The body constantly monitors its internal environment, making small adjustments to keep everything functioning at the optimum level, irrespective of external conditions. This series of ongoing regulatory processes which ensures

The location of the major skeletal areas or bony landmarks of the dog. You can feel these when you examine your dog.

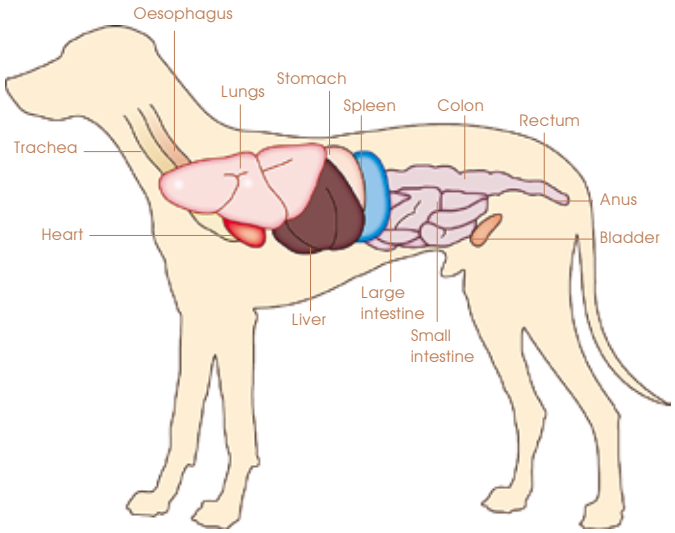


Heavy panting indicates a lack of equilibrium or homeostasis.

the body stays in equilibrium is called homeostasis; essentially, 'keeping things balanced.' The system uses a negative feedback mechanism that is triggered whenever there is a deviation from the normal range of, for example, blood sugar levels, water content, blood pressure, oxygen levels, temperature, and so on. Any deviation initiates a response within the body to counter the change

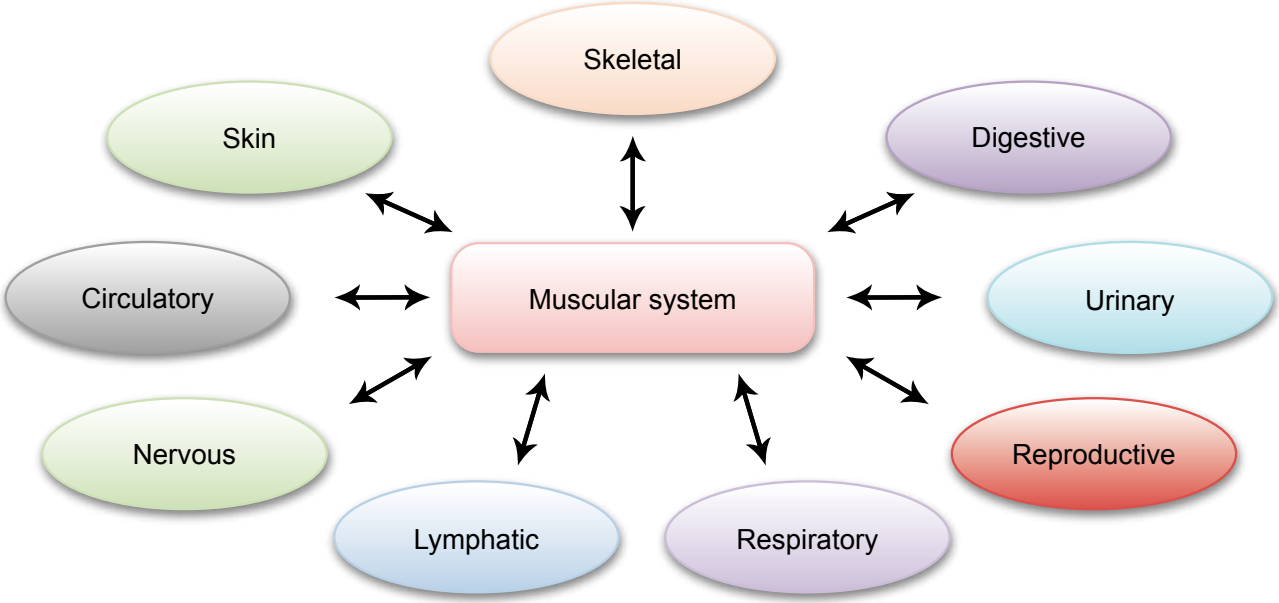
and restore balance as quickly as possible. The way it works can be likened to the thermostat on a radiator that controls and maintains the temperature within a room. For example, if the dog gets too hot, its temperature is lowered to the correct level using the body's thermoregulatory system. The dog loses heat through its tongue by panting, while blood vessels within the skin dilate to aid cooling. The homeostatic mechanism is also involved in maintaining a correct balance during times of excitement, stress or relaxation.

At the cellular level the bodies of almost all animals, including, of course, the dog, are made up of millions and millions of tiny structures called cells. Groups of similar cells combine to form tissues like muscles and bones, and different tissues combine to form organs like the heart and lungs. Ultimately, therefore, all of the systems in the body operate at the cellular level. Each cell must be in balance, with the correct level of salts, oxygen, minerals, and so on. When we massage, we



The major internal organs of the dog.

All the systems of the body have a direct influence on the muscular system, as shown by this diagram. By influencing the muscular system through the skin, we can have a positive effect on other body systems.



influence the body on a cellular basis by changing the environment within and surrounding different cells to produce a synergistic effect on the whole area. By using massage, we can have an effect on blood cells, muscle cells, nerve cells, and the cells that comprise the skin. Massage can even have a positive effect on the cellular development of the skeletal system. Let's take a look at each of the major systems within the body.

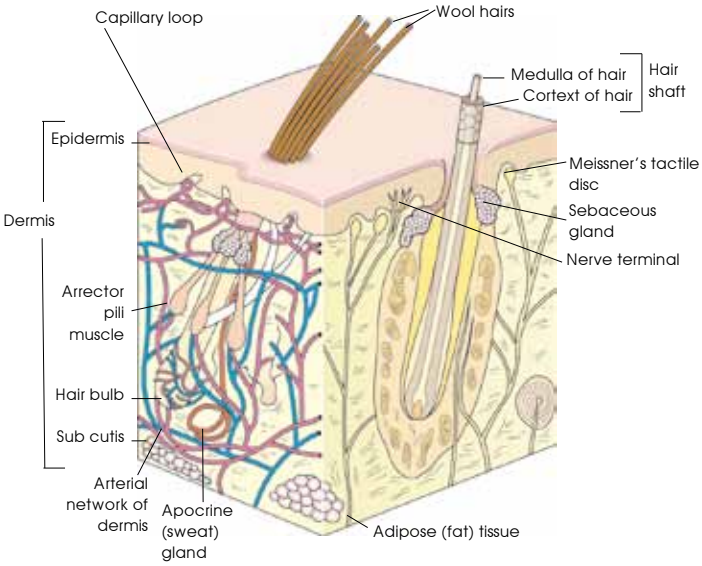
The skin

The skin forms the outer body covering of the dog, and is one of the body's major organ systems; in fact, the biggest organ in the body. As befits such an important structure, the skin has several different roles. Firstly, it acts as a waterproof, physical and chemical barrier, helping to prevent harmful germs or other substances entering the body.

The skin also has a protective role in the form of pigmentations that help provide protection from solar radiation. Blood vessels in the skin help regulate heat: hair follicles in the skin also assist in the regulation of body temperature; the hairs can be raised or lowered, altering the amount of air trapped near the skin.

In the dog, the hairs are also raised or lowered as social signals to other dogs. Scent glands in the skin are used for marking territory, and other glands are responsible for attracting the opposite sex for mating. Whiskers around the mouth help the dog to sense its environment. Other neural (nerve) receptors in the skin provide further information about the environment, such as the external temperature. They also sense pain, helping the dog to avoid serious injury.

The skin is vital for the production of Vitamin D, and is also involved in antigen stimulation.



A cross-section of canine skin.

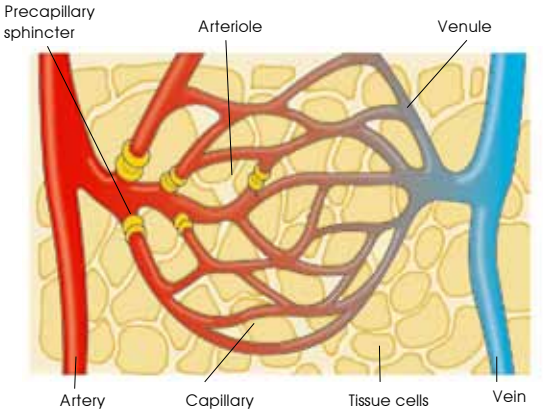
The skin and massage

We use the dog's skin as a conduit or connection when we massage. The skin has specialized neural receptors, via which we can elicit changes to the body both mechanically and reflexively through touch (see the chapter entitled *How to massage your dog*). These neural receptors connect with the matrix of nerve fibres that run throughout the entire body, and can detect movement, touch, temperature, pressure and stretch signals given through the hands when massaging. Within the superficial fascia, the tissue layer just beneath the skin, lie additional neural receptors that also connect throughout the entire body of the dog. Thus, with this matrix of neurological connections, the effects of massage can be transmitted to almost any part of the body via the skin. The action of massage can also aid natural drainage of the sebaceous glands, helping to remove toxins and keeping the coat healthy.

The circulatory system

The body's blood circulatory system can be

divided into two sections: the arterial section and the venous section. The arterial section is the delivery system: most arteries carry oxygen-rich blood to the cells. The blood is pumped by the heart through an extensive network of arteries; these are wide, muscular vessels (tubes) that pulse the fluid to all parts of the body under high pressure. The arteries then divide into thinner vessels called arterioles, and the blood – now under less pressure – is delivered to the cells of the body. At this point the blood passes into the extremely small capillaries that form a capillary bed surrounding



A small capillary bed, demonstrating the transfer of blood from the arterial delivery system to the venous waste disposal system.

the organs and tissues, from where it passes directly into the cells by osmosis. While the arterial blood is being delivered, the reverse procedure is also taking place, and venous blood is taken from the cells.

The venous section of the circulatory system is the body's waste disposal department, removing the toxic products of cell metabolism, such as carbon dioxide (metabolism means the physical and chemical processes necessary for life). The venous system transports the blood from tiny capillaries into progressively larger vessels – the opposite to the arterial system. Instead of using the heart to provide high pressure to move the blood through the veins, the system relies instead on skeletal movements, movements of the diaphragm causing internal pressure changes, and the effect of the pumping action of the main arteries which are in very close proximity to some of the main veins.

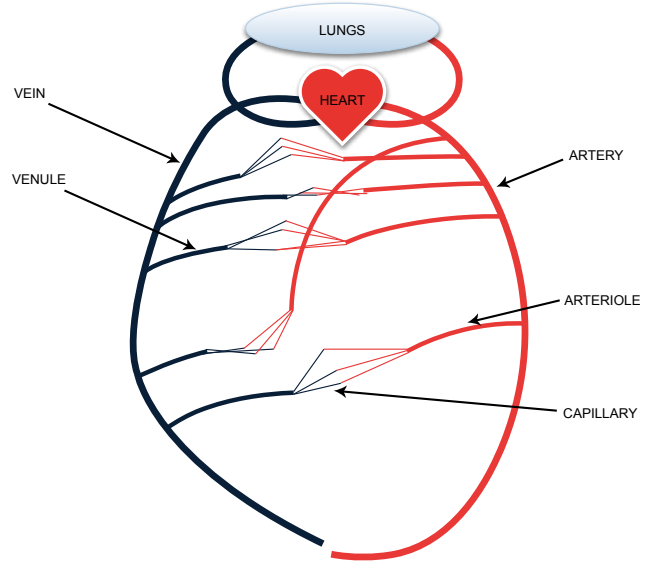
The venous return has a more difficult and no less important role than the arterial delivery, since it must carry the body's toxins through a complicated network of vessels as quickly as possible to organs such as the liver and kidneys, and then to the heart and lungs, where they can be rendered harmless or expelled from the body before the blood is reoxygenated by the lungs and pumped back through the arterial system.

The venous system relies on several main methods for transporting the blood:

1 Skeletal movement
2 The position of larger vessels near to main arteries means that their pumping action has a small knock-on effect
3 Internal pressure changes (diaphragm movement)

How massage influences the circulatory system

The reason why massage is so beneficial in aiding blood circulation is found by examining the processes which influence the venous return. Of these, skeletal movement is the most important and efficient way or enhancing the process. Therefore, when we massage the superficial muscles, we are gently replicating skeletal movement. By aiding the removal of toxic venous blood within your dog's system, you will facilitate nourishing arterial delivery instead. Furthermore, venous blood can collect within the body, especially if there is a lack of activity or function, and this in turn will suppress healing. The introduction of arterial blood will have a positive effect on the wellbeing of the body. Also, by encouraging relaxation and facilitating deeper breathing, massage helps to increase the fluctuation of internal pressure changes, and enhance flow through the more relaxed muscles.



A schematic plan of the dog's blood circulatory system.

The nervous system

The nervous system passes messages from one part of the body to another. Masterminded by the brain, the nervous system controls, coordinates and directs activities such as perception, thought and movement. Some of the messages may carry sensory (feel) information to the brain, and others may transfer motor (movement) information from the brain to the muscles. In this constant and busy 'motorway' of messages, there will be instructions for both voluntary actions and involuntary reactions.

The nervous system has two main parts: the central nervous system and the peripheral nervous system. The central nervous system consists of the brain and the main nerves travelling down the spinal cord. These nerves receive messages (information) from the body, which are passed to the brain. The brain assimilates the information and transmits instructions to the nerves of the spinal cord, which distribute the instructions to other parts of the body.

THE NERVOUS SYSTEM	
Central nervous system	Consists of the brain (equivalent to the hard drive on a computer, it retains the information and programmes), and the main nerves travelling down the spinal cord. These nerves distribute messages from the brain and receive messages and information from the body. The brain assimilates and reacts
Peripheral nervous system	Consists of the nerves that arise from the vertebrae and serve the body's systems and organs (equivalent to the software of a computer, it performs the actions). Within this system lie three different divisions:
Sensory	Inner body sensations sent to the brain: pressure, heat, cold, movement, position
Motor messages	Sent from the brain to initiate voluntary movement, to adjust to situations and surroundings depending on stimuli. Instruct voluntary muscles to contract and relax
Autonomic (involuntary)	Sympathetic (fight or flight) or parasympathetic (rest and digest). Controls internal organs and blood vessels