Vertebrates can be divided into two groups depending on whether or not they control their internal temperature. Amphibia (frogs) and reptiles are said to be "cold blooded" (poikilothermic) because their body temperature approximately follows that of the environment. Birds and mammals are said to be warm blooded (homoiothermic) because they can maintain a roughly constant body temperature despite changes in the temperature of the environment.

Heat is produced by the biochemical reactions of the body (especially in the liver) and by muscle contraction. Most of the heat loss from the body occurs via the skin. It is therefore not surprising that many of the mechanisms for controlling the temperature of the body operate here.

**Reduction Of Heat Loss**

When an animal is in a cold environment and needs to reduce heat loss the erector muscles contract causing the hair or feathers to rise up and increase the layer of insulating air trapped by them.

Anatomy and physiology of animals Hair muscle.jpg

Diagram 5.11a) Hair muscle relaxed................Diagram 5.11b) Hair muscle contracted

Heat loss from the skin surface can also be reduced by the contraction of the abundant blood vessels that lie in the
dermis. This takes blood flow to deeper levels, so reducing heat loss and causing pale skin (see diagram 5.12a).

Anatomy and physiology of animals Reduction of heat loss by skin.jpg

Diagram 5.12a) Reduction of heat loss by skin

Shivering caused by twitching muscles produces heat that also helps raise the body temperature.

Increase Of Heat Loss

There are two main mechanisms used by animals to increase the amount of heat lost from the skin when they are in a hot environment or high levels of activity are increasing internal heat production. The first is the expansion of the blood vessels in the dermis so blood flows near the skin surface and heat loss to the environment can take place. The second is by the production of sweat from the sweat glands (see diagram 5.12b). The evaporation of this liquid on the skin surface produces a cooling effect.

The mechanisms for regulating body temperature are under the control of a small region of the brain called the hypothalamus. This acts like a thermostat.
Heat Loss And Body Size

The amount of heat that can be lost from the surface of the body is related to the area of skin an animal has in relation to the total volume of its body.

Small animals like mice have a very large skin area compared to their total volume. This means they tend to lose large amounts of heat and have difficulty keeping warm in cold weather. They may need to keep active just to maintain their body temperature or may hibernate to avoid the problem.

Large animals like elephants have the opposite problem. They have only a relatively small skin area in relation to their total volume and may have trouble keeping cool. This is one reason that these large animals tend to have sparse coverings of hair.

Contributors and Attributions

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