# 5.4.1 Thermoregulation

Thermoregulation is the process by which the human body maintains a stable internal temperature despite changes in the external environment. Human beings are warm-blooded animals, meaning they keep their body temperature relatively constant at around 37°C.

## Definition of Thermoregulation

Thermoregulation is the maintenance of constant body temperature through physiological and behavioral mechanisms. The body uses various organs and systems to balance heat gain and heat loss.

## Importance of Thermoregulation

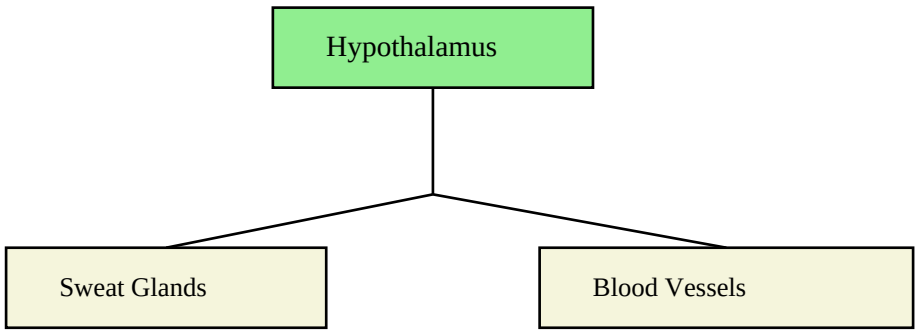
Thermoregulation is important because enzymes and cells function properly only within a narrow temperature range. Very high or very low temperatures can damage cells and affect normal body functions.

Maintains enzyme activity. Protects body cells from damage. Supports metabolism. Maintains normal body functioning. Prevents overheating and excessive cooling.

## Role of the Hypothalamus

The hypothalamus is a part of the brain that acts as the body's thermostat. It detects changes in blood temperature and sends signals to different organs to correct temperature changes.

### *Diagram: Temperature Control System*




## Body Responses When Temperature is High

When the body becomes too hot due to exercise or hot weather, the hypothalamus activates cooling mechanisms.

Sweat glands produce sweat. Sweat evaporates and cools the skin. Blood vessels near the skin widen (vasodilation). More heat is lost from the body. Breathing rate may increase.

## Body Responses When Temperature is Low

When the body becomes too cold, the body reduces heat loss and increases heat production.

Muscles contract rapidly causing shivering. Blood vessels narrow (vasoconstriction). Less blood flows near the skin surface. Hair stands upright to trap air. Metabolism increases to produce heat.

## Comparison Between Vasodilation and Vasoconstriction

| Feature | Vasodilation | Vasoconstriction |
|---|---|---|
| Meaning | Widening of blood vessels | Narrowing of blood vessels |
| Occurs when | Body is too hot | Body is too cold |
| Effect | Heat loss increases | Heat loss decreases |
| Skin appearance | Skin becomes red | Skin becomes pale |

## Disorders Related to Thermoregulation

Failure of thermoregulation can lead to serious health problems.

**Fever:** Increase in body temperature due to infection. **Heat stroke:** Dangerous overheating of the body. **Hypothermia:** Extremely low body temperature. **Dehydration:** Loss of too much water due to sweating.

## Prevention and Care

The following methods help maintain healthy body temperature: Drink enough clean water. Wear suitable clothes depending on weather. Avoid excessive exposure to sunlight. Eat balanced food. Rest during extreme heat.

## Important Notes

- The normal human body temperature is approximately 37°C.
- The hypothalamus acts as the thermostat of the body.
- Sweating cools the body through evaporation.
- Shivering helps produce heat.
- Thermoregulation is controlled mainly by negative feedback.

## Summary

Thermoregulation is an important homeostatic process that maintains stable body temperature. The hypothalamus controls temperature regulation through mechanisms such as sweating, vasodilation, vasoconstriction, and shivering. Proper thermoregulation is necessary for enzyme activity and normal body functioning.

## Review Questions and Answers

**1. What is thermoregulation?**

Thermoregulation is the maintenance of constant body temperature.

**2. Which part of the brain controls body temperature?**

The hypothalamus controls body temperature.

**3. What happens during vasodilation?**

Blood vessels widen to increase heat loss.

**4. Why do humans shiver?**

Shivering produces heat when the body is cold.

**5. What is the normal human body temperature?**

The normal body temperature is about 37°C.

**6. Mention one disorder related to thermoregulation.**

Heat stroke or hypothermia.

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