

Unit 2 Metabolism & Survival

Key Area 4: Metabolism in Conformers and Regulators

The ability of an organism to maintain its metabolic rate is affected by **external abiotic factors**.

Abiotic factors which affect an organisms ability to maintain metabolic rate include:

- **Temperature**
- **Salinity**
- **pH**

Conformers

A Conformers **internal environment is dependant upon its external environment**.

Conformers use **Behavioural responses** to **maintain optimum metabolic rate**. E.g. Lizards can maintain their body temperature by basking in the sunshine.

Behavioural responses by conformers allow them to **tolerate variation** in their external environment to maintain optimum metabolic rate.

Conformers have **LOW METABOLIC COSTS** and a **NARROW RANGE OF ECOLOGICAL NICHES**.

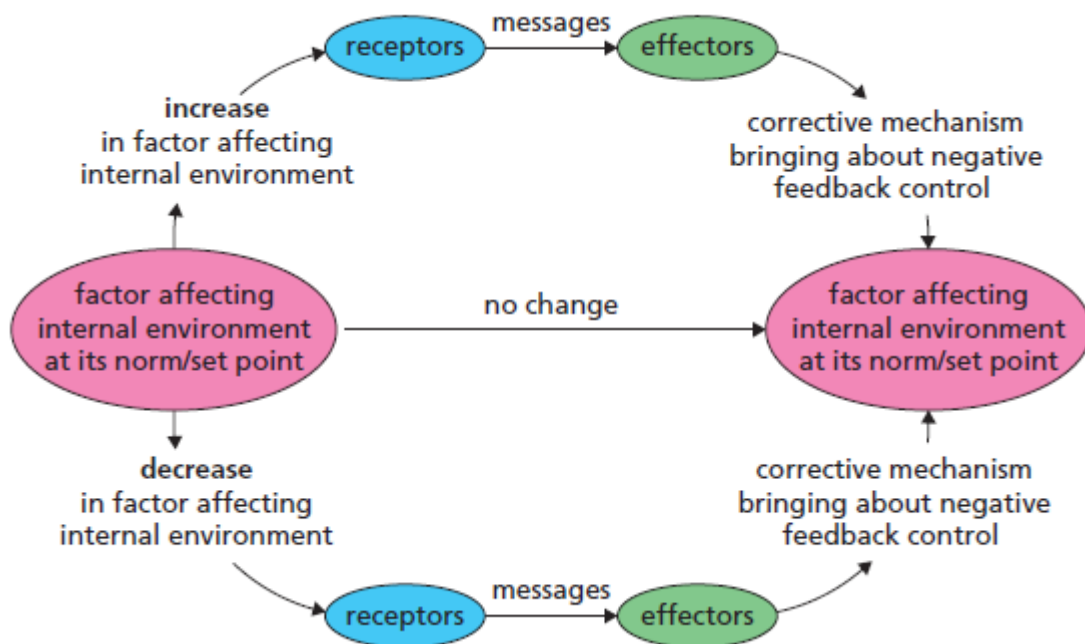
Regulators

A Regulator **can maintain its internal environment regardless of its external environment**.

Regulators use metabolism to control their internal environment, which **INCREASES THE RANGE OF POSSIBLE ECOLOGICAL NICHES**.

This regulation **requires ENERGY** to achieve **HOMEOSTASIS**. This **INCREASES THEIR METABOLIC COSTS**.

The control mechanism by which Regulators maintain Homeostasis is called **NEGATIVE FEEDBACK CONTROL**.



THERMOREGULATION BY NEGATIVE FEEDBACK CONTROL

The **Hypothalamus** is the temperature monitoring centre in the brain.

Information is communicated by electrical impulses through nerves to the effectors, which bring about corrective responses to return temperature to normal.

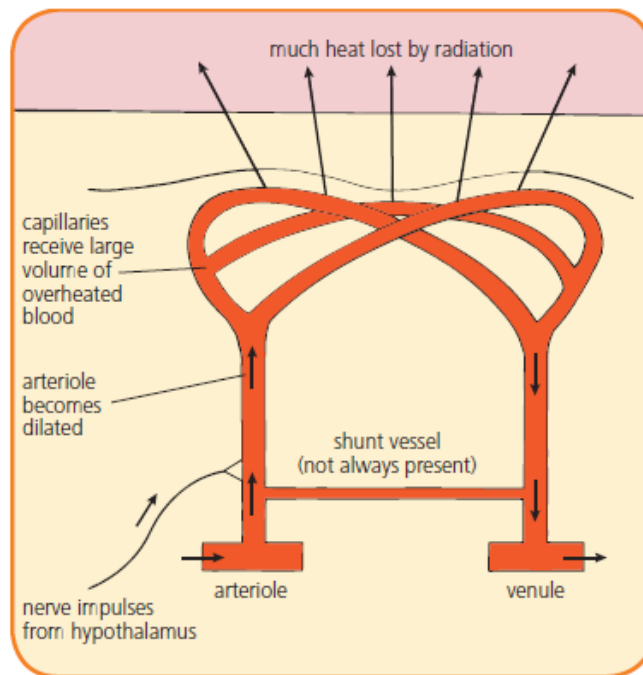
Response to an Increase in Body Temperature

When the Hypothalamus detects an **increase in body temperature**, **nerve impulses** are sent to **effectors** to make response measures which return temperature to normal. These include:

- Sweating
- Vasodilation of Blood Vessels
- Decreased metabolic rate

Sweating : body heat is used to evaporate water in the sweat, cooling the skin.

Vasodilation of Blood Vessels: dilation of blood vessels , **increases blood flow to the skin** (reason why we look red when hot) and allows **heat to be lost by radiation** from the skin surface.



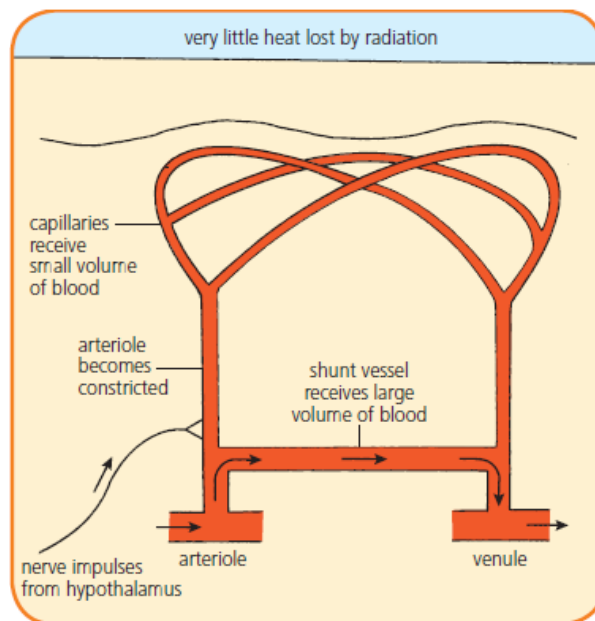
Response to a Decrease in Body Temperature

When the Hypothalamus detects a **decrease in body temperature**, **nerve impulses** are sent to **effectors** to make response measures which return temperature to normal. These include:

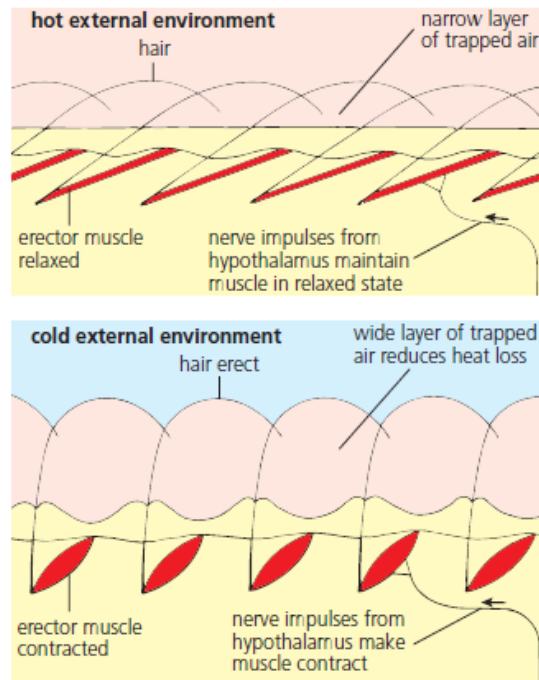
- Shivering
- Vasoconstriction of Blood vessels
- Hair erector muscles contracting
- Increased metabolic rate

Shivering: Muscle contraction generates heat to return body temperature to normal.

Vasoconstriction of Blood vessels: Decreased blood flow to the skin (reason why we look pale when cold) decreases heat loss from the skin surface.



Hair Erector muscles contract: this traps a layer of Insulating air.



Increased metabolic rate: more heat is produced to return body temperature to normal.

Importance of Regulating Temperature

Thermoregulation (control of internal body temperature to within tolerable limits) is essential for **optimal enzyme activity** and **high diffusion rates** to maintain metabolism.